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ABSTRACT

Recent research suggests that quality of experience in child care centers and family child care homes in the United States is mediocre. The research literature over the past 20 years indicates how variations in quality of care in center-based and family child care affect children's development. Higher levels of quality across a wide range of child care settings are associated with enhanced social skills, reduced behavior problems, increased cooperation, and improved language in children. There appear to be no detrimental effects of infants' attachment relations with their mothers as long as mothers provide adequate attention to infants at home. Longitudinal studies have found that some benefits in the social and cognitive domains persist into elementary school. The dimensions of quality most strongly related to child well-being include structural features of the child care setting such as lower child-staff ratios and smaller group sizes and caregiver-child dynamics, especially the caregiver's sensitivity and responsiveness in interactions with children. Structural features of child care settings provide the foundation for higher-quality dynamics, justifying increased costs that smaller ratios and group sizes entail. The research base for these findings includes studies using experimental and nonexperimental designs. Stronger designs and analytic techniques are needed to understand the contribution of child care quality and family characteristics on children's development. Not enough is currently known to guide policy by specifying the point at which lower levels of quality are clearly detrimental to children. Defining thresholds of quality along its critical dimensions is the next research challenge. (Contains approximately 75 references.) (KB)

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ARE THEY IN ANY REAL DANGER?

WHAT RESEARCH DOES--AND DOESN'T--TELL US ABOUT CHILD CARE QUALITY AND CHILDREN'S WELL-BEING

Child Care Research and Policy Papers

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Child Care Research and Policy Papers
Lessons from Child Care Research Funded by the Rockefeller Foundation

ARE THEY IN ANY REAL DANGER?

WHAT RESEARCH DOES--AND DOESN'T--TELL US ABOUT CHILD CARE QUALITY AND CHILDREN'S WELL-BEING

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DEDICATION

This paper is dedicated to Richard R. Ruopp. For 24 years, Dick has been my colleague, mentor, critic, and friend. Through my first forays into program evaluation and policy research, he guided, supported, cajoled, and inspired. He taught me that research is an empty enterprise if it doesn't produce knowledge to enhance the lives of our most disenfranchised citizens--particularly the young and the poor. Twenty years ago, he accepted the challenge of designing and conducting a study to provide guidance on the features of child care settings that policymakers could regulate to improve outcomes for children. Today, the National Day Care Study still stands as a landmark of effective policy research. Never one to shy away from conflict, adversity, or hard work, Dick considered no detail too small to warrant attention, nor too devilish to ignore. Several years ago, while struggling through the early stages of Lou Gehrig's Disease, he advised me, "God is in the detail." All of us who strive to understand the complexities of quality and its benefits for children's well-being are indebted to the details of Dick Ruopp's life and work in uncountable ways that extend well beyond my personal debt.

J.M.L.

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SUMMARY

Researchers, policymakers, and the public are increasingly concerned that children in child care settings may not be receiving the quality programming needed to foster their developmental well-being. In the past decade, the early child care and education field has gained increased understanding of the dimensions of quality and ways to measure its facets. Unfortunately, research suggests that quality in both child care centers and family child care homes around the country is generally mediocre and especially so in settings used by low-income families. Child care research has moved from asking whether child care is detrimental to children's development to attempting to understand how variations in quality of care affect children's development.

Extensive research in child care and early childhood education conducted over the past 20 years has clearly demonstrated strong, positive relationships between a variety of quality measures and various dimensions of children's development and well-being. Across a wide range of settings, from center-based child care to family child care homes, research shows that higher levels of quality are associated with enhanced social skills, reduced behavior problems, increased cooperation, and improved language in children. There appear to be no detrimental effects on infants' attachment relationships with their mothers so long as mothers provide adequate attention while their babies are at home. Longitudinal studies have found some of these benefits--in both the social and cognitive domains--to persist into the elementary-school years. The dimensions of quality that are most strongly associated with enhanced child well-being include structural features of the child care setting (such as lower child-staff ratios and smaller group sizes) and caregiver-child dynamics (including the caregiver's sensitivity and responsiveness in interactions with children). Although the dynamics of the caregiver-child relationship are the heart of quality, structural features of child care provide the foundation for higher-quality dynamics, justifying the increased costs that smaller ratios and group sizes entail.

The research base for these findings includes studies using both experimental and nonexperimental designs. Stronger designs and more carefully applied analytic techniques are needed to understand the contributions of child care quality and family background characteristics in determining the course of children's development and well-being. At this stage in the evolution of research on child care quality, we do not know enough to be able to guide policy by specifying the point at which lower levels of quality are clearly detrimental to children's well-being. Defining thresholds of quality along its critical dimensions is the clear challenge for the next wave of child care research.

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I. INTRODUCTION

Recent studies have proclaimed the sorry state of child care in the United States with the bold statement that ". . . most child care--especially for infants and toddlers--is mediocre in quality and sufficiently poor to interfere with children's emotional and intellectual development" (Helburn et al. 1995). Six years earlier, the National Child Care Staffing (NCCS) study reached a similar conclusion, although presented from the perspective of child care staff: "By failing to meet the needs of the adults who work in child care, we are threatening not only their well-being but that of the children in their care" (Whitebook, Howes, and Phillips 1989).

Few would question the facts about the levels of child care quality in this country in relation to professional standards. The most objective picture comes from nationally representative survey data collected six years ago. The Profile of Child Care Settings (PCCS) study concluded that programs for infants and toddlers fail to meet professional recommendations in basic structural features such as group size and child-staff ratios, although centers serving preschool-age children generally conform to standards (Kisker, Hofferth, Phillips, and Farquhar 1991). These features are only proxies for program quality, however. Studies examining classroom dynamics using focused observations have greater potential to help us understand features of program quality that may influence children's well-being and development. Unfortunately, these studies (such as those by the Cost, Quality, and Child Outcomes Study Team 1995; Kontos, Howes, Shinn, and Galinsky 1995; and Whitebook et al.1989) have been based on selective samples of programs, even though the samples have often been quite large and geographically diverse.

The concern of child care professionals and researchers about the quality of child care in the United States is not universally shared. In particular, some politicians are skeptical about whether increasing levels of quality really makes much difference. Skepticism about the importance of improving quality is especially conspicuous when lawmakers face the reality that creating higher quality--including lower ratios

and higher salaries--costs money. This skepticism is reflected in a reporter's question at the press conference in which Helburn and her colleagues presented their conclusions about mediocre quality: "So, are these children in any real serious danger?" (cited by Daniel 1995). As frustrating as this question is to those who are convinced that higher quality is important for children's well-being and development, it deserves a serious answer. It is not the only question we must ask, however. Implicit in the reporter's question is the notion that some threshold of quality exists, below which children would be harmed. Beyond that, the child care profession also wants to know whether improved quality, at levels above this threshold, will *enhance* children's lives in important ways.

Answers to both the threshold and enhancement questions are important for guiding child care policy and will have even greater significance as the need for child care increases under welfare reform proposals that have shorter benefit periods and more stringent training and work requirements. Interest in the potential benefits of child care and other early education programs for children is also fueled by the current interest in school readiness (Love, Aber, and Brooks-Gunn 1994). The Goal 1 Technical Planning Group of the National Education Goals Panel clearly views access to quality early care and education programs as an important condition supporting children's readiness for school (Kagan, Moore, and Bredekamp 1995).

A. PURPOSE OF THE PAPER

The purpose of this paper is to summarize and analyze the research literature on the relationships between variations in child care quality and children's well-being and development in center-based and family child care. For each type of care, we discuss findings relating to infants and toddlers (birth to age 3) and findings for preschoolers (3- to 5-year-olds). We also critique the design and methodology of this research with the aim of identifying approaches that will enable the field to produce even stronger findings in the future. We fully recognize the challenges to conducting research in the context of operating programs. This context does not readily lend itself to rigorous research methods. Nevertheless,

shortcomings in design and analysis methods place limitations on the clarity of the resulting message. Stronger designs can reduce ambiguities in our understanding of the impact of quality on children's lives.

Before discussing the research summaries, we first review ways in which researchers have defined and measured quality. Refinements of definitions and sophistication of measurement represent significant advancements in this body of research over the last twenty years. We also summarize what is known about current levels of quality in child care centers and family child care homes.

B. HIGHLIGHTS OF FINDINGS

The available research does not allow us to answer questions as to whether children who receive mediocre-quality care are in any real danger or at what level low quality becomes harmful. We argue, however, that these are only two of the important questions about child care quality. We believe most parents want their children to benefit--both intellectually and socially--from their child care experience even if the initial reason for enrollment is simply working parents' need for someone to watch over their children. For this reason, research must guide our understanding of what happens to children in a variety of care settings. From the research reviewed here, we derive five conclusions:

1. ***Variations in quality are positively associated with child outcomes.*** Although the evidence is largely correlational, coming from studies in which quality and child outcome variables are measured contemporaneously, the preponderance of evidence supports the conclusion of a substantial positive relationship between child care quality and child well-being. Evidence for this relationship encompasses multiple dimensions of quality and diverse indicators of children's well-being; it persists in spite of wide variations in study contexts, designs, assessment instruments, populations studied, and analytic strategies.

2. ***Classroom dynamics appear to be more important than structure.*** As studies have become more sophisticated in measuring classroom dynamics, the importance of structural variables as correlates of child outcomes seems to have declined. The National Day Care study (Ruopp, Travers, Glantz, and Coelen 1979) presented some of the strongest evidence for the impact of such structural variables as group size on children's cognitive and social development. Recent studies show the importance of caregiver interaction styles (such as "appropriate caregiving") and global characterizations of program dynamics (such as "developmentally appropriate practices"). We now conclude that the structural features of quality provide the foundation for higher-quality classroom dynamics and justify the increased costs that smaller ratios and group sizes entail.

3. ***We do not know what levels of quality produce detrimental effects on children.*** One of Belsky's (1990) conclusions still holds: "While staff training, group size, and even caregiver-child ratios have been implicated in studies of variation in day care quality, the field still lacks specific knowledge about the point at which group size becomes too large, training insufficient, and ratios inadequate." The same applies to the dynamic quality variables. The field also lacks consensus on a definition of "harm." Furthermore, our conclusions are limited and may even underestimate the importance of quality--because the lowest-quality child care settings in which children are most likely to suffer physical or emotional harm are unlikely to have volunteered to participate in the research.

4. ***Research has not ruled out selection bias in the relationships between quality and children's well-being.*** More and more studies are using sophisticated analytic techniques to control for family income, racial/ethnic group membership, and other factors that may be strongly associated with the quality of the programs in which families enroll their children (see, for example, Cost, Quality, and Child Outcomes Study Team 1995). Unfortunately, these procedures do not rule out the possibility that factors other than program quality may be more important determinants of children's well-being. We need more research to understand that joint contributions of child care quality and family background and dynamics.

5. ***More-rigorous research designs are sorely needed.*** In reviewing two decades of research, with emphasis on the past 10 years, we find that the powerful design of the National Day Care study has not been replicated. Even though this study did not measure program dynamics using now-standard instruments, such as the Early Childhood Environment Rating Scale (ECERS) (Harms and Clifford 1980), its design controlled for a number of key family background characteristics that we suspect are responsible for selection bias in the correlational studies. More important, the National Day Care study measured *change* in children's cognitive and social performance during the one-year study period and related that change to quality variations in child care centers. Unambiguous information for guiding child care policy requires similar designs using current understandings of quality dimensions and measurement techniques.

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II. BACKGROUND

Early research in child care, in tandem with the preschool intervention literature, provides a backdrop for understanding more recent studies on child care quality. In this section, we discuss these research strands after presenting the evolving conceptualization of quality and what we now know about levels of quality in center-based and family child care in the United States.

A. DEFINING AND MEASURING CHILD CARE QUALITY

Quality is a concept typically used to describe features of program environments and children's experiences in these environments that are presumed to be beneficial to children's well-being. These presumptions are based on a blend of research and practice. The research describes empirical associations between features of child care environments and aspects of children's growth and development. The wisdom of practice has been ably summarized by the National Association for the Education of Young Children (NAEYC) in what it refers to as "developmentally appropriate practice" (Bredekamp 1987). In high-quality, developmentally appropriate programs, caregivers encourage children to be actively engaged in a variety of activities; have frequent, positive interactions with children that include smiling, touching, holding, and speaking at children's eye level; promptly respond to children's questions or requests; and encourage children to talk about their experiences, feelings, and ideas. Caregivers in high-quality settings also listen attentively, ask open-ended questions and extend children's actions and verbalizations with more complex ideas or materials, interact with children individually and in small groups instead of exclusively with the group as a whole, use positive guidance techniques, and encourage appropriate independence. In addition to teacher or caregiver behaviors, which form the core of the dynamics of children's classroom experiences, definitions of quality often include structural features of the program (such as classroom structure and safety features), program administration, and supportive services (Ferrar 1996; Ferrar, McGinnis, and Sprachman 1992; and Ferrar, Harms, and Cryer 1996). No clear agreement exists,

however, on how to categorize the large number of environmental variables that the dimensions of quality comprise. Howes (1992) views program quality as one of three broad sets of variables required for understanding characteristics of child care.[1] For Howes, quality variables fall into three categories: (1) structure; (2) process; and (3) practice (or curriculum). Harms (1992) makes two major distinctions among early childhood program variables: (1) administration; and (2) children's program functions. Administration includes personnel, program resources, and management; children's program functions include structural variables (space, materials, people, and recurring patterns) and processes or interactions.

Layzer, Goodson, and Moss (1993) define quality in terms of three sets of classroom processes: (1) the pattern and content of activities and groups across the day; (2) behavior and interactions of teaching staff; and (3) behavior and interactions of children. These authors consider other program elements as potential predictors of quality. Although many researchers consider such factors as child-staff ratio or teacher experience to be components of quality, Layzer et al. classify these factors (which are primarily characteristics of the classroom, the program, and the staff) as program elements that are important only because they may strongly influence the quality reflected in classroom processes. Love, Ryer, and Faddis (1992) also view quality from the classroom level, but define quality to include structural variables (such as group size and child-staff ratio) along with classroom dynamics, children's behavior, and the behavior of caregivers. They consider other program variables (such as staff qualifications, child turnover, program auspice, and parent involvement) as contextual factors that may influence classroom quality.

Phillips (1987), on the other hand, argues that quality is a configuration of ingredients that include child-staff ratios, staff training, and parent participation. Phillips and Howes (1987) note that quality dimensions include (1) structural aspects (such as group composition and staff qualifications), (2) dynamic aspects of children's daily experience, and (3) contextual features (such as type of setting and staff

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[1]The other two variables are child care history and the nature and form of the child care setting (for example, informal or formal, for profit or nonprofit).

stability). Similarly, in developing definitions and measures of quality for the Expanded Child Care Options (ECCO) study, Ferrar (1996) takes a broad view of quality in center-based care as encompassing four domains: (1) the classroom (including daily routines, child and adult interactions, physical environment and materials, developmentally appropriate learning activities, daily schedule, and staff collaboration and support), (2) the program's supportive services (including health, mental health, nutrition, social services, and parent involvement), (3) program administration (staff qualifications, group size and ratio, planning and evaluation, employment practices, and continuity of care and transitions to new settings), and (4) safety (facilities, outdoor play space, and safety procedures). Analogous domains apply in family child care (Ferrar et al. 1996).

Two common features recur in these conceptualizations of quality in program environments: (1) the distinction between the dynamic (interactional) and static (structural) features of the classroom; and (2) the acknowledgment that the larger program context (or characteristics found outside the classroom) is an important determinant of the quality of children's classroom experiences. Research on the effects of quality on children has examined variables representing both the classroom environment that children experience and features of program context that influence the classroom environment.

B. WHAT WE KNOW ABOUT CHILD CARE QUALITY IN THE UNITED STATES

The supply of child care has increased dramatically in the last two decades. In 1990, the number of centers was three times the number that existed in the mid-1970s, and enrollments quadrupled during this period. The average number of staff members, however, increased by only 25 percent--not enough to maintain constant child-staff ratios (Willer, Hofferth, Kisker, Divine-Hawkins, Farquhar, and Glantz 1991). Across all socioeconomic groups and all regions of the country, some children receive care in enriching, high-quality settings, while others receive care in substandard settings. Most children, however, are cared for in settings that are neither enriching nor likely to be detrimental to their well-being (Hayes, Palmer, and Zaslow 1990; Hofferth 1991; and Kisker et al. 1991). In 1993, almost 10 million children under age 5

needed child care while their mothers worked. Almost half were primarily cared for by relatives; one in three preschoolers were in organized child care facilities (Casper 1996). Thus, millions of children each year are potentially affected by the quality of their child care settings.

According to the PCCS study (Kisker et al. 1991), average group sizes and child-staff ratios in child care centers generally conform to professional recommendations for preschool-age children but fail to meet professional recommendations for infants and toddlers. For example:

- In center care, the average number of infants per group was seven, and the average child-adult ratio was 4:1. These numbers are within the NAEYC recommendations.
- For 1-year-olds, the average group size was 10, with an average child-adult ratio of between 6:1 and 7:1. These numbers are considerably worse than the NAEYC recommendation of 5:1 when group size is 10.
- For 2-year-olds, the average group size was 12, and the ratio was between 7:1 and 8:1. NAEYC recommends 12 as the upper limit for groups of 2-year-olds, and then only when the staff is "highly qualified." The ratio should be 6:1 or better.
- Group size was 17, on average, for 3- to 5-year-olds. The NAEYC recommendation is 14 to 20. The average ratio of 10:1 for groups of 3- to 5-year-olds was at the upper limit of the NAEYC standards. NAEYC recommends this ratio only when the staff is highly trained.

Most of these levels are only slightly worse than professional recommendations. Because these levels represent averages, however, it is clear that many centers do not meet the standards recommended. For example, for preschoolers in centers surveyed, the average child-staff ratio of almost 10:1 conforms to standards. Yet, 32 percent of programs have ratios greater than 10:1, and one-fifth have ratios greater than 12:1. Thirty percent of programs have group sizes of 20 or more. In groups serving 2-year-olds, where 12 is the maximum recommended, more than one-third of centers exceed this recommendation. Furthermore, about one-quarter have group sizes and ratios that do not meet state licensing standards--and the state standards often are considerably less demanding than the recommended NAEYC quality levels. For example, in 1994-1995, only 15 states required centers serving young toddlers (ages 1 to 2) to have child-staff ratios that meet or come close to professional guidelines (3:1 or 4:1) (The Children's Foundation

1995). Quality also varies somewhat by program auspice. For example, centers operated by for-profit chains reported more children per staff member than did private nonprofit programs.

In a large-scale study that focused on child care in urban settings (Atlanta, Boston, Detroit, Phoenix, and Seattle), the NCCS study rated quality in 643 classrooms in 227 centers. These ratings were based on direct observation of classroom conditions and caregiver-child interactions. Seventeen percent of the centers were located in low-income U.S. Census tracts, most in urban areas. Using a standard observation instrument, the study obtained measures of "developmentally appropriate" activity in classrooms in which the average child-staff ratios met recommended standards (for example, the average ratio for preschool classrooms was about 8:1, and 76 percent of classrooms had ratios of 10:1 or better). On a scale in which 5 is considered "good" care, the *average* scores were between 3 and 3.5 for infant, toddler, and preschool classrooms (3.17, 3.57, and 3.56, respectively)[2]. The distribution of scores was even more discouraging. More than two-thirds of the classrooms scored below 4, and one-third scored below 3, which the researchers considered "minimally adequate" (Whitebook et al. 1989). Only 12 percent of the classrooms met or exceeded the score of 5 associated with "good" classroom practices.

Findings from the more recent Cost, Quality, and Child Outcomes in Child Care Centers (CQCO) study showed somewhat higher levels of quality than the NCCS study (Cost, Quality, and Child Outcomes Study Team 1995). Observational data (using the same scales used in Whitebook et al.) from 225 infant-toddler classrooms and 511 preschool classrooms in California, Colorado, Connecticut, and North Carolina showed that the average infant-toddler quality score was 3.42; the average for preschool classrooms was 4.22. The distribution of infant-toddler classroom scores was discouraging, with 40 percent below 3.0

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[2]The scales were the widely used ECERS (Harms and Clifford 1980) in preschool classrooms and the Infant-Toddler Environment Rating Scale--ITERS (Harms, Cryer, and Clifford 1990)--in infant-toddler settings. The low ratings are especially significant given the acceptable child-staff ratios in NCCS study classrooms.

and only 8 percent above 5.0. On the other hand, only 10 percent of preschool classrooms scored below 3.0, and almost one-quarter were above 5.0.

The training of caregivers represents another indication of quality. The PCCS study found that nearly half the teachers in centers (47 percent) had a college degree; only 14 percent had no formal training beyond high school. Only 36 percent of the teachers in the CQCO study classrooms and 31 percent of teachers in the NCCS study had at least a bachelor's degree. If caregiver training is an important program quality indicator, these two national studies may have sampled programs whose quality is somewhat lower than would be true for a nationally representative sample.[3]

Turnover among classroom staff can also affect the quality of children's experiences. About half of all centers experienced teacher turnover in the year preceding the PCCS study survey, with an average turnover rate of 50 percent in these centers. (The overall average turnover was 25 percent, however, because half the centers had no turnover.) For-profit chains had the highest turnover. The NCCS study (conducted only in the five urban areas mentioned earlier) found that "staff turnover rates were disturbingly high," with directors reporting an annual turnover rate of 41 percent among all staff (Whitebook et al. 1989). Annual teacher turnover was similar in the CQCO study: 43 percent. The NCCS study found turnover to be associated with observed quality measures. Departing staff members generally worked in centers with lower "developmentally appropriate activity" scores (at the preschool level). These staff members also had shown less "appropriate caregiving" and were rated as more "detached" than staff members who remained with the centers.

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[3]On the other hand, some researchers suggest that the national studies may seriously *underestimate* how poor the quality is because they rely on volunteer centers or family child care homes (Phillips 1995). For example, centers in the CQCO study agreed to participate at rates ranging from 41 and 44 percent in North Carolina and California to 68 percent in Colorado and Connecticut. The study of Quality in Family Child Care and Relative Care (Galinsky, Howes, Kontos, and Shinn 1994) used two methods to select the sample; 78 percent of regulated providers identified from lists agreed to participate, but only 56 percent of eligible providers referred by the mothers using them agreed to be observed.

Some research suggests that quality in programs serving low-income families is worse than the national average. On a national level, indications of the lower quality of care available to low-income families come from the NCCS study. Its findings showed that children from low-income families are underrepresented in the population using accredited child care centers. In addition, annual staff turnover rates were higher and the percentage of center budgets allocated to teaching staff was lower in centers used primarily by low- and middle-income families. The level of staff training was also lower in these centers. Interestingly, children from middle-income families ($15,000 to $60,000 annual income) seemed to receive the worst care, as seen in higher child-staff ratios and lower scores for appropriate caregiving (Whitebook et al. 1989). In family child care settings, however, evidence suggests that low-income children receive the lowest quality care. Upper-income families included in the study of Quality in Family Child Care and Relative Care were more than twice as likely to use regulated providers than were low-income families and used relative providers infrequently. Almost half the low-income families, on the other hand, used relative providers, and those not using relatives were divided in their use of regulated and unregulated providers. Furthermore, providers enrolling children from low-income families were less sensitive and showed more restrictive child-rearing attitudes than did those serving higher-income families (Kontos, Howes, Shinn, and Galinsky 1995).

Scattered evidence from a number of the studies we reviewed for this paper further suggests that low-income, disadvantaged, and minority families are more likely to enroll their children in centers or family child care homes that are lower in quality. The CQCO study, for example, found that child care quality was significantly related to maternal education and child ethnicity. In a Canadian study, Schliecker, White, and Jacobs (1991) found that the socioeconomic status of families correlated .44 with ECERS scores, and children in high-quality centers came from families whose socioeconomic status was approximately one standard deviation higher than the families of children in low-quality centers. Based on Family Day Care Rating Scale (FDCRS) scores (Harms and Clifford 1989), Kontos et al. (1995) found statistically

significant differences in global quality across three income groups: mean FDCRS scores were 2.57, 3.12, and 3.8 for the care being used by low-, middle-, and higher-income families, respectively.

Parents using centers of higher-quality care in Kontos' earlier (1991) study were more highly educated, were more likely to be using a subsidy, and placed less value on children's social skills than parents using lower-quality care. Looking at other dimensions, Howes and Stewart (1987) noted that parents who were most stressed and restrictive in their child-rearing attitudes selected the lowest-quality child care arrangements for their children. In studying family child care, Goelman and Pence (1988) found that "higher-resource" families enrolled their children in better-quality homes. In their review of infant day care, Barton and Williams (1993) concluded that "children most in need of highly supportive child care environments are those *least* likely to be placed in such settings" (emphasis added).

This brief summary demonstrates that the general level of child care quality available to millions of young children is one that many experts consider to be inadequate, mediocre, and perhaps even detrimental to children's well-being. Furthermore, children from low socioeconomic status families under stress are more likely to receive lower-quality out-of-home care.[4] Next, we turn to the research literature to see what light it sheds on the extent to which variations in quality make a difference to children's well-being and development.

C. EARLY RESEARCH ON CHILD CARE

Several significant reviews of the literature on child care quality and its relationship to children's behavior and development appeared in the late 1980s and early 1990s. Before turning to more recent

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[4]This paper does not address the issue of differential access to care for families with different resources, which further complicates the quality picture. Recent analyses of the PCCS study and census data show that most low-income families are not able to consider center-based child care options unless subsidies are available (Kisker and Love 1996).

studies, we first summarize the conclusions of these earlier reviews and discuss how the focus of research on the effects of child care has changed over the years.[5]

Lamb and Sternberg (1990) noted that much of this early research attempted to determine the "effects of day care." Zaslow (1991) described the major question of this first wave of day care research (primarily conducted in the 1970s) as, "Is day care harmful?" These studies often failed to acknowledge differences among types of care (for example, family child care, center-based case, and relative care) and did not measure variations in the quality of care. Furthermore, in making comparisons among types of care or between nonmaternal care and exclusive maternal care, researchers failed to consider differences in families' values or characteristics that might relate to the choice of child care for their children. Clarke-Stewart's review of research between 1971 and 1990 found all but two studies "showed that children in day care did at least as well--and sometimes better--on tests of mental and intellectual development" (Clarke-Stewart 1992, p. 64). She noted that the two studies with negative outcomes had "shockingly low" child-staff ratios and poor training for their caregivers. Belsky (1990) noted that this research typically was conducted in university-based centers of presumably higher quality, so that the generally positive findings were not generalizable.

Because of concerns about possible effects of maternal separation (growing out of clinical research in the 1950s and 1960s), much of the early child care research studied one major dependent variable: strength of the child's attachment to his or her mother. This was followed by studies of the development of child-caregiver attachment and peer relationships in child care settings. Summarizing the results of several studies, Lamb and Sternberg (1990) concluded that children in out-of-home facilities could remain attached to their parents and might even be more sociable with peers and other adults. As research entered what Clarke-Stewart (1987) referred to as the second wave, researchers had only begun to examine how

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[5]For a more thorough review of this literature, see Hayes et al. (1990, Chapter 3) and Doherty-Derkowski (1995).

variations in quality and type of care differentially affect children. The question asked in this wave, in the late 1970s, was, "What are the effects of different kinds of child care?"

In the late 1980s, researchers--and the media--focused on the possible adverse effects of out-of-home care on infants' attachment and social development. Belsky (for example, 1988) provoked extensive debate when he published research reviews apparently documenting associations between nonmaternal care in the first year of life and both elevated risk of insecure infant-mother attachment and later increases in aggressiveness, noncompliance, and withdrawal. The wave of research that followed Belsky's conclusions has largely failed to confirm his dire pronouncements. Lamb and Sternberg (1990), for example, concluded that the two variables Belsky was concerned about (extent of day care and age of child's entry into nonmaternal care) have been defined in so many different ways that generalizations about their effects are not possible. Furthermore, none of the studies in the wave of attachment research examined *variations* in quality of care. Most recently, preliminary findings from the child care study conducted by the National Institute of Child Health and Human Development (NICHD) did assess quality of care in a variety of settings--center care, family child care, and father care. At 15 months of age, infant-mother attachment was not diminished by nonmaternal care, so long as the child did not experience inattentive mothering while at the same time being in poor-quality child care (NICHD Early Child Care Research Network 1996).

In the 1980s, child care research entered its third wave and asked more-complex questions, such as, "How do child care qualities combine with family factors to produce effects on children's development?" (Clarke-Stewart 1987). While children are in full-day child care, Clarke-Stewart noted, families continue to exert their influences. In fact, family variables are sometimes stronger predictors of child outcomes than child care program characteristics (Barton and Williams 1993; and Kontos and Fiene 1987). Studies in the 1970s and early 1980s were largely restricted to single sites or programs. Phillips (1987) urged researchers to conduct multisite studies that would better reflect the national diversity in the child care

market. A number of major national studies have now done so (for example, Cost, Quality, and Child Outcomes Study Team 1995; Galinsky, Howes, Kontos, and Shinn 1994; Kontos, Howes, Shinn, and Galinsky 1995; and Whitebook et al. 1989).

In the past decade, questions related to the effects of variation in child care quality on children's development have predominated, and researchers have become more sophisticated in their conceptualization and measurement of quality dimensions. Studies also indicate a greater appreciation for the possible selection factors that cloud our understanding of how quality affects children. Many studies now control statistically for family and/or child characteristics that may affect the type and quality of care in which children are enrolled (whether by choice or circumstance). As Belsky (1990) and Clarke-Stewart (1987) have observed, some studies have extended this work by examining the additive or interactive effects of family factors and child care variables. Unfortunately, as we noted earlier, unambiguous conclusions are complicated by the fact that studies have shown that, "families that are more stressed, both psychologically and economically, are more likely to *use lower quality care*" (Hayes et al. 1990, emphasis added). We return to this point in our discussion of research design issues (Section IV).

D. RELEVANCE OF THE PRESCHOOL INTERVENTION LITERATURE

Although this paper focuses on quality issues in child care, much of the research and evaluations of preschool program interventions is also relevant. Child care and preschool settings are generally distinguished from each other by purpose and structure, with child care encompassing programs that provide services to meet the full-day child care needs of working parents. Preschool programs typically are part day, are more likely to have an "educational" focus, and only partially (if at all) meet parents' child care needs.[6] Nevertheless, classroom dynamics (which, as we discuss in the next section, are among the

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[6]For example, the PCCS study found that Head Start and public-school-based preschool programs were twice as likely as other types of centers to have child development and school preparation as their main goals. Full-day child care programs were most likely to report their main goal as providing a warm, (continued...)

most widely studied quality dimensions) in the two types of programs are highly similar. And, the ECERS, which is the most widely used instrument for measuring center-based program quality, was expressly developed "to assess gradations of quality across basic elements found in *all* early childhood programs" (Harms and Clifford 1983, emphasis added). The ECERS was created from research- and practice-based knowledge of quality dimensions in day care, preschool education programs, and preschool classrooms serving children with special needs. It has been used in almost all types of settings.

Unfortunately, the literature on preschool intervention does not lend itself to a comparable review of the correlates or effects of quality, because researchers have not emphasized descriptions of the quality dimensions of the programs under study. In contrast to the child care literature, the research designs have been more likely simply to contrast two or three treatment groups, or an intervention and control group, and not treat quality as a continuous variable against which child outcomes are evaluated. The well-known Perry Preschool study (Schweinhart, Barnes, and Weikart 1993), the Abecedarian project (Campbell and Ramey 1994), and the Syracuse Family Development Research Program (Lally, Mangione, and Honig 1987) fall into this category. In general, however, we believe it is legitimate to interpret this literature as evidence of the benefits of enhanced program quality in that the treatments were designed as high-quality programs. The outcomes for children in the high-quality programs were then contrasted with outcomes for children who experienced lower-quality programs or who had no program experience.

In the preschool education literature, quality is most often associated with the concept of developmentally appropriate practice. In a recent review of this literature, Bryant, Burchinal, Lau, and Sparling (1994) identified several studies that illustrate the relationship between quality defined as developmentally appropriate practice and child outcomes. For example, the preschool curriculum comparison project conducted by the High/Scope Educational Research Foundation in the 1960s found

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(...continued)
loving environment for the children (Kisker et al. 1991).

that children who attended a developmentally appropriate, child-centered program showed better social adjustment than similar children who attended a teacher-directed program implementing a direct-instruction curriculum (Schweinhart, Weikart, and Larner 1986). In a study of children attending North Carolina state preschool programs, Bryant, Peisner-Feinberg, and Clifford (1993) found that children's communication abilities at the end of preschool were positively associated with the appropriate caregiving factor on the ECERS and, similarly, that kindergarten vocabulary development was positively associated with the preschool classroom quality ratings. Burts and her colleagues have engaged in a program of research in which preschool and kindergarten classroom environments varying in degree of developmental appropriateness have been associated with a range of child outcomes, with attendance in developmentally appropriate kindergartens being associated with lower frequencies of stress behaviors (Burts, Hart, Charlesworth, Fleege, Mosely, and Thomasson 1992; and Hart, Burts, Durland, Charlesworth, DeWolf, and Fleege 1995). In their own two-year study of Head Start children in programs varying in quality, Bryant et al. (1994) found that children attending higher-quality Head Start classes (as measured by the ECERS) had better cognitive--but not social--outcomes at the end of the Head Start year. Marcon (1994) assessed the kindergarten performance of children in the District of Columbia schools who had attended three different prekindergarten models (identified by the prekindergarten teachers' reports of their beliefs and classroom practices): (1) child-initiated; (2) academically directed; and (3) middle-of-the-road (a model with beliefs and practices that fell between the first two). Children from the child-initiated preschool classes demonstrated the highest learning levels, followed by those in academically oriented classes. Children from the middle-of-the-road classes scored lowest in language, social, and motor development.

This highly selective review of the preschool intervention literature illustrates its relevance to issues of the quality of children's early care and education experience. As we see next, however, the child care research literature provides much richer analyses of the dimensions of quality programming.

III. SYNTHESIS OF RESEARCH ON QUALITY

Our review suggests that the field has come a long way since Lamb and Sternberg (1990) concluded that researchers focused too much "on the effects of day care per se instead of recognizing that day care has a myriad of incarnations and must always be viewed in the context of other events and experiences in the children's lives." We begin this section with a summary of the multiple dimensions along which researchers have measured quality. We then synthesize findings on the important relationships between quality and children's well-being--first in center-based child care and then in family child care settings.

A. QUALITY DIMENSIONS STUDIED IN RESEARCH ON QUALITY

In the last 5 to 10 years, researchers have recognized the myriad incarnations of child care by defining and measuring a large number of quality variables, but they have not been as successful in understanding contextual variables. The studies we review in this paper have measured variations in child care quality *and* outcomes for children in center-based child care (Table 1) and family child care (Table 2). These studies, which conceptualize and measure program quality in rich and varied ways, have measured multiple dimensions of classroom dynamics, classroom structure, and staff characteristics. Aspects of classroom structure have included seven major sets of variables:

- Child-staff ratio (Field 1980; Howes, Phillips, and Whitebook 1992; Howes, Smith, and Galinsky 1995; Kontos, Howes, Shinn, and Galinsky 1995; Ruopp, Travers, Glantz, and Coelen 1979; and Studer 1992)[7]
- Group size (Holloway and Reichhart-Erickson 1988; Howes and Rubenstein 1981; Howes et al. 1992; Kontos et al. 1995; Ruopp et al. 1979; and Studer 1992)
- Age of oldest child in group (Howes and Rubenstein 1981)

[7]Studies are divided in referring to this variable as staff-child or child-staff ratio. We choose the latter because (1) lower, or smaller, ratios are then more intuitively synonymous with "better" ratios; and (2) a numerical value that can range from 1 to some larger number is mathematically preferable for analysis than a fraction that ranges from 0 to 1.

- Classroom scheduling (Love et al. 1992)
- Classroom safety (Love et al. 1992)
- Organization and spaciousness of the classroom area (Holloway and Reichhart-Erickson 1988; and Ruopp et al. 1979)
- Stability in arrangements (Howes 1988; Howes and Hamilton 1993; and Howes and Stewart 1987)

Measures of classroom dynamics are especially rich.

- Positive caregiver behaviors, such as attentiveness, encouragement, engagement, sensitivity, and responsiveness (Hestenes, Kontos, and Bryan 1993; Kontos et al. 1995; Love et al. 1992; Melhuish, Mooney, Martin, and Lloyd 1990a; and Melhuish, Lloyd, Martin, and Mooney 1990b)
- Negative caregiver behaviors, such as harshness, detachment, and critical comments (Love et al. 1992)
- Caregivers' verbal interaction with children, such as communication and conversation (File and Kontos 1993; McCartney 1984; Melhuish et al. 1990a; Melhuish et al. 1990b; Phillips, McCartney, and Scarr 1987; and Vandell, Henderson, and Wilson 1988)
- Security of caregiver-child relationship (Howes and Hamilton 1993)
- Quality of caregiver-child interactions (Holloway and Reichhart-Erickson 1988)
- Caregiver guidance, such as setting limits and managing the classroom (Dunn 1993; and Ruopp et al. 1979)
- Use of age-appropriate materials in the classroom (Holloway and Reichhart-Erickson 1988)
- Use of nonportable objects (Howes and Rubenstein 1981)
- Developmentally appropriate activities and variety of activities (Howes et al. 1992; and Love et al. 1992)
- Appropriate caregiving (Howes et al. 1992)
- Caregiver involvement in and support of children's activities (File and Kontos 1993; and Ruopp et al. 1979)
- Caregiver socialization practices (Howes 1990)

- Overall, composite, or global classroom quality (Goelman and Pence 1987; Goelman and Pence 1988; Goodman and Andrews 1981; Helburn et al. 1995; Howes 1988; Howes 1990; Howes and Olenick 1986; Howes and Stewart 1987; Kontos 1991; Kontos 1994; Kontos et al. 1995; Lamb, Hwang, Broberg, and Bookstein 1988; McCartney 1984; McCartney, Scarr, Phillips, and Grajek 1985; Peterson and Peterson 1986; Phillips et al. 1987; Schliecker et al. 1991; Studer 1992; Vandell et al. 1988; and Vandell and Powers 1983)

Finally, recent studies (in contrast to many earlier ones) have recorded a variety of staff characteristics and related them to child outcomes. For example:

- Level of formal education (Howes et al. 1995; and Ruopp et al. 1979)
- Extent of experience in child care (Kontos 1994; and Ruopp et al. 1979)
- Specialized training in early childhood education and other certificates or credentials (Howes et al. 1995; and Galinsky, Howes, and Kontos 1995)
- Staff turnover and changes in teaching staff (Howes and Hamilton 1993)
- Experience of the center director (Phillips et al. 1987)

The research has been much less thorough and systematic in redressing the second weakness Lamb and Sternberg noted in the earlier studies: failing to recognize that children's child care experience occurs in the context of other events and experiences in their lives. Some of the studies we reviewed include such variables in their analyses (as Belsky 1990 noted), but we do not yet have a body of systematic research that allows us to draw firm conclusions about the effects of child care quality when other factors are controlled for. Studies have examined variables describing child and family characteristics, such as the following:

- Family income (Studer 1992)
- Mother's education (Kontos 1991; and Kontos 1994)
- Mother's employment (Kontos et al. 1995)
- Family structure--single- versus two-parent (Kontos 1991; and Schliecker et al. 1991)

- Family socioeconomic status (Schliecker et al. 1991)
- Child's racial/ethnic group membership (Helburn et al. 1995)
- Child's age at initial out-of-home care enrollment (Howes 1990; and Kontos 1991)
- Child's gender (Howes 1988; Howes and Olenick 1986; and Howes and Stewart 1987)
- Duration of child's day care experience (Field 1991; and Kontos 1991)
- Child's temperament (Hestenes et al. 1993)
- Family social support (Howes and Stewart 1987; and Lamb et al. 1988)
- Family stress (Howes and Stewart 1987)

These lists of variables reflect major advances in the richness of child care research during the past decade. In the next sections, we turn to the research findings. We will see how researchers have capitalized on detailed assessments of classroom structure and dynamics, staff characteristics, and the context in which they exist to generate increased understanding of their relationships to children's well-being.

B. RELATIONSHIPS BETWEEN CENTER-BASED CHILD CARE QUALITY AND CHILDREN'S WELL-BEING

The 28 studies listed in Table 1 (which summarizes their samples, designs, and key findings) all demonstrate associations between various measures of child care center quality and one or more child outcome measures.[8] A number of factors complicate the task of synthesizing the findings of these studies. The studies differ in (1) design (one-time contemporaneous assessments of child care quality and child outcomes, longitudinal studies, and pre-post assessments over a relatively short period), (2) age of children in child care (infant-toddler years and preschool child care), (3) age of followup (in the case of longitudinal

[8]We have not attempted to assess the extent to which a "file drawer problem," or a larger number of unpublished studies with no statistically significant effects, may bias these findings (Roggman, Langlois, Hubbs-Tait, and Rieser-Danner 1994).

designs), (4) measures of child care quality, (5) sample demographics (ranging from predominantly white and middle class to predominantly low income and minority), and (6) child outcome domains measured.

For convenience in discussing findings, we grouped the studies by type of design and, within groups, listed them alphabetically by author. The first 18 child care center studies employed a design we describe as contemporaneous. These studies used nonexperimental designs; furthermore, assessments of child care quality and child outcomes were conducted at approximately the same time. Although rich in measures of both quality and child outcomes, these studies suffer from their failure to control for selection bias. In reviewing these studies, therefore, we must assess how well statistical controls might have effectively separated program quality and family background variables in analyzing relationships with child outcomes. (Because such an assessment requires its own context, we present a systematic discussion of design and analysis issues in Section IV.)

The next six studies used longitudinal designs. Most longitudinal studies conducted one-time follow-up assessments at varying periods after children's child care experience; for example, three years after a preschool child care experience, when children were in first grade (Howes 1988); four years after preschool, when children were age 8 (Vandell et al. 1988); three to four years after infant day care, at age 4 to 5 (Howes and Hamilton 1993); four to five years after infant day care (Field 1991, study 1); and up to nine years after infant day care, in sixth grade (Field 1991, study 2). Only one study included repeated measures in a longitudinal design throughout an extended period of child care enrollment: Howes and Hamilton (1993) observed the children and teachers at six-month intervals between the children's first and fourth birthdays. Although these studies controlled statistically for a number of family background characteristics, selection bias remains a serious issue, as we discuss later. In addition, except for the Howes and Hamilton study, longitudinal studies fail to account for the intervening experiences that might affect children's performance at the time of followup.

The last two studies used pre-post designs. These studies conducted assessments of program quality and child outcomes at the beginning and end of a one-year period (Ruopp et al. 1979) and at two and four years after baseline (Howes et al. 1995).[9] Again, even within these two studies, considerable variation exists along all of the dimensions on which the studies differ. We next review findings from these studies by summarizing (1) the outcomes found to be associated with higher quality, (2) the quality dimensions that have been found to be linked with positive outcomes, and (3) factors found to modify the quality-outcomes relationships.

1. Child Outcomes Most Commonly Associated with Higher Quality

Outcomes in the socioemotional domain have been by far the ones most commonly assessed. Most studies have focused exclusively on associations between quality measures and children's socioemotional behavior and development. A sizable minority of studies, however, have also measured children's cognitive development, with aspects of language development predominating. A small number of studies (those with longitudinal designs) assessed children's academic performance in school following their child care experience. What emerges from our brief summary of these studies is a clear picture of children being socially, emotionally, and cognitively better off when enrolled in higher-quality child care centers.

Findings from Studies Using Contemporaneous Designs. One of the most commonly studied social domains involves children's interaction with peers. From studies using contemporaneous designs, we learn how peer interactions are associated with quality indexes while children are enrolled in the center. When quality is higher, studies find peer interactions (including associative-cooperative levels of play) to be "more optimal" (Field 1980); social development (including considerateness and sociability) to be more positive (McCartney et al. 1985; and Phillips et al. 1987); affect to be more positive (Howes 1990); and social skills (such as creativity, independence, extroversion, and interest in interacting with other children)

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[9]We did not classify the Howes et al. Florida study as longitudinal because different children were sampled at baseline and at each of the two follow-up periods.

to be more advanced (Cost, Quality, and Child Outcomes Study Team 1995). Several studies show that complexity of play behaviors with peers is a positive function of quality indicators (see, for example, Dunn 1993; File and Kontos 1993; and Howes et al. 1995). The higher levels of social problem-solving skills found in higher-quality centers by Holloway and Reichart-Erickson (1988), although based on children's verbal responses in a structured setting, are consistent with the observed and rated social behaviors found in other studies.

Children exhibit fewer or less serious behavior problems when enrolled in higher-quality classrooms (Howes et al. 1995; Kontos 1991; and Love et al. 1992) and better social adjustment. Adjustment has been defined in a variety of ways, including degree of socially deviant behavior (Dunn 1993; and Kontos 1991), that overlap with definitions of problem behaviors. In related areas, other studies show children in higher-quality classrooms to comply more with, and be less resistant to, adult requests (Howes and Olenick 1986; and Peterson and Peterson 1986); to be more cooperative, responsive, and innovative (Ruopp et al. 1979), to be more securely attached to their teachers, a common index of sound emotional development (Howes et al. 1992; and Howes et al. 1995); and to be both adult and peer oriented (Howes et al. 1992).

Studies also have demonstrated the negative social manifestations associated with *lower* levels of quality. For example, lower quality is associated with children being engaged in more solitary play and aimless wandering (Vandell and Powers 1983); being more uninvolved in classroom activities (Love et al. 1992); having a more intense "negative affect," such as frowning and crying accompanied by vocalizations and body movements (Hestenes et al. 1993); and showing less sustained verbal interactions (Peterson and Peterson 1986).

Self-control, or the self-regulation of behavior, is considered an important precursor to a successful school experience. Few studies have measured this outcome, but those that have find positive associations with program quality. For example, Howes and Olenick (1986) found children in high-quality centers to

self-regulate more than children in low-quality centers. Task orientation (another behavioral characteristic valued by elementary schools) also has been found to be greater in children attending higher-quality centers (McCartney et al. 1985; and Phillips et al. 1987).

In the cognitive domain, several studies have found receptive language to be positively associated with center quality (Cost, Quality, and Child Outcomes Study Team 1995; McCartney et al. 1985; Schliecker 1991; and Studer 1992). Studies have also found, however, that children in higher-quality care settings perform better on tests of premath skills, such as counting and making comparisons (Cost, Quality, and Child Outcomes Study Team 1995), and verbal intelligence (McCartney 1984). At a younger age, children in settings with less verbal communication and less adult responsiveness showed lower levels of language development (Melhuish et al. 1990b).

Findings from Longitudinal Studies. If any of the apparent benefits of higher-quality child care can be found to persist beyond the time children spend in their centers, there would be an even greater incentive to invest in enhanced quality. A number of studies have followed the children into kindergarten and later grades in school after having measured aspects of the quality of the children's child care settings. Both socioemotional and cognitive outcomes have been assessed in these studies.

Studies that followed children into kindergarten, first grade, and beyond have found children from higher-quality centers to be less distractible, more task-oriented, and more considerate (at kindergarten--Howes 1988); to have fewer behavior problems (at first grade--Howes 1988); and to be happier, less shy, more socially competent, and to have friendlier interactions with peers (at age 8--Vandell et al. 1988). Studies that followed children in the preschool years, after their participation in center-based care as infants, also have found enduring associations with quality indicators. These include more positive and gregarious behavior with peers and less social withdrawal and aggression (Howes and Hamilton 1993) and greater personal maturity and social skills with peers and adults (Lamb et al. 1988).

Potential benefits in the cognitive domain also have been reported. Children who attended higher-quality programs were found in sixth grade to be assigned to a gifted program at a higher rate (Field 1991), to receive higher math grades (Field 1991), and to make better academic progress and be rated higher on such school-related skills as class participation in first grade (Howes 1988).

2. Quality Dimensions Most Commonly Associated with Positive Outcomes

As discussed earlier, quality variables measured in the child care research literature typically are categorized into structural variables (such as child-staff ratio and group size), classroom dynamics (such as positive caregiving and developmentally appropriate practices), and staff characteristics (such as education and experience). There are almost as many measures of these variables as there are studies. To reduce the complexity of synthesizing hundreds of variables, we take some liberties in clustering findings relating to similar aspects of quality.[10]

The most commonly measured structural variable is child-staff ratio. Considerable evidence exists that lower ratios (that is, fewer children per adult) are associated with a wide range of positive developmental indicators. At the same time, research suggests that structural features of programs, while extremely important, are associated with child well-being to the extent that they provide the conditions making more positive classroom dynamics possible. The National Day Care study (Ruopp et al. 1979), in its quest to understand the impact of "regulatable" quality variables, was the earliest large-scale study to systematically examine structural variables. Using a combination of experimental and quasi-experimental designs, it found enhancements in children's social and cognitive development when a lower ratio existed in combination with smaller group size. Ruopp et al. concluded, however, that we should not

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[10]At some point, the field must address the problem of defining and measuring specific aspects of child care program quality, as well as child outcome measures. Some researchers invent new instruments when validated measures already exist. In other instances, studies replicate the use of flawed instruments whose only advantage is that others have used them. A full discussion of the measurement problems--on both the quality and child well-being sides--is beyond the scope of this paper, however.

focus on any one component of quality; instead, quality must involve *configurations* of children and caregivers. Group size is so intertwined with ratio that nominally favorable ratios may not allow for quality care if the group becomes too large.

One of the more carefully designed studies we have reviewed, the Florida Child Care Quality Improvement study (Howes et al. 1995), found many significant improvements in children's intellectual and emotional development after Florida instituted stricter requirements for ratios in infant and toddler centers. This is particularly strong evidence because Howes et al. measured children's intellectual and emotional development, language development, and behavior problems both before and after the change in state ratio requirements. Under the more favorable ratio conditions, children engaged in more cognitively complex play with objects, showed higher levels of linguistic narrative and discourse skills, were more securely attached to their teachers, and showed less evidence of aggression, anxiety, and hyperactivity. The report does not say how changing ratios may have affected group sizes (presumably they also became smaller), but improved ratios did result in significant changes in program environments. Teachers became more warm, sensitive, and nurturing; showed greater responsiveness and encouragement; and were less negative in their disciplinary techniques. As one might expect, along with these changes the researchers found improvements in global measures of quality (assessed by the ECERS in preschool classrooms and the ITERS in infant-toddler rooms).

The Florida study is especially useful in helping to disentangle the effects of different quality dimensions. Many studies using contemporaneous designs have found strong correlations between structural measures (such as ratio) and program dynamics. When classrooms have lower ratios, the amount of adult interaction with children is greater (Layzer et al. 1993), and teachers and children interact in a more beneficial manner (Whitebook et al. 1989). When classrooms score higher on structural dimensions such as safety and health, they are also rated as more developmentally appropriate (Love et al. 1992). By using a pre-post design, Howes et al. demonstrate that changing one structural variable--which

is readily regulatable--leads to several things happening together: global quality improves, teacher-child interactions improve, and children's well-being is enhanced along a number of dimensions. Howes et al. ruled out improved teacher credentials as the determinant of the positive outcomes, but also noted that the largest increases in some of the child outcomes occurred when classrooms changed to teachers with higher credentials, along with the ratio change.

Other studies support the conclusion that ratio, in and of itself, is *not* the most important determinant of children's well-being. Dunn (1993) found no significant relationship between ratio or group size and children's social and cognitive development. Using an experimental pre-post design, Love et al. (1992) found that changing ratios to *less* favorable conditions in California child care centers did not significantly affect dynamic quality measures or selected aspects of children's behavior in the classroom.

Many studies have investigated the influence of teacher (or, more generally, caregiver) qualifications on other indicators of program quality and on child outcomes. The NCCS study (Whitebook et al. 1989), the largest study to focus on staff characteristics, reached three conclusions that are most pertinent to our consideration of quality: (1) teachers tend to provide higher-quality care and services to children, as measured through "appropriate and sensitive caregiving," when they have had more formal education, more early childhood training at the college level, and earn higher wages and benefits; (2) children are more competent in social and language development when they attend centers with lower staff turnover; and (3) higher-quality centers have higher staff wages, a better adult work environment, lower teacher turnover, and a more highly educated and trained staff.

In summary, studies are finding important relationships between a number of the dynamic variables describing child care center quality and measures of children's development or well-being. Such variables as appropriate caregiving, developmentally appropriate practices, and caregiver responsiveness describe caregiver-child interactions and the social environment in ways that directly affect children's daily experiences. A number of studies have failed to show strong relationships between structural features of

a program or classroom. Those that do (like the Florida study just described) demonstrate that structural/regulatable features do not operate in isolation but imply (and perhaps cause) positive changes in the classroom dynamics. It seems to us that the structural features set the stage, or provide the necessary conditions, for positive dynamics to occur. By themselves, such variables as lower ratios, smaller group sizes, and safer physical equipment and space do not improve language development or enhance the cognitive complexity of children's play. Nevertheless, they may be extremely important as conditions that permit caregivers to be more responsive and to create developmentally appropriate experiences for the children.

3. Factors that Modify Relationships Between Quality and Child Outcomes

Researchers are increasingly recognizing the importance of controlling for child and family background variables when analyzing relationships between quality indicators and child outcome measures (see, for example, Cost, Quality, and Child Outcomes Study Team 1995; and Phillips et al. 1987). We briefly touch on this issue here, while recognizing that the research is not systematic enough to permit broad generalizations about these interactions. Findings are likely to differ from setting to setting because so many factors differ across studies--the particular background factors studied, how they are measured, and the context in which they occur in the particular study. For example, the National Day Care study found that the effect of group size on receptive language was independent of child age, gender, race, family income, and other family background characteristics. On the other hand, the more recent CQCO study found a stronger relationship between quality and receptive language for minority children (even though, the authors emphasize, for most variables the quality-outcome relations were similar for children of all backgrounds). The divergent analysis strategies used (some quite inappropriately, as we discuss later) further complicate generalizations across studies.

Several studies have examined differential effects depending on the age at which children enter child care. Howes (1990), for example, found that teacher socialization practices better predicted child

outcomes when children enrolled as infants, but that family socialization practices best predicted outcomes for children who enrolled as toddlers. Kontos (1991), however, studying 3- to 5-year-old children, found no differential effects of quality as a function of age at entry (which varied from 1 to 60 months of age).

Other studies have attempted to determine whether quality indicators operate differently for girls and boys. Howes and Olenick (1986) found different patterns of relationships among child care, family, and child and parent behaviors. In particular, child care quality predicted self-regulation and task persistence in toddler boys but not in girls. The authors concluded that boys are more sensitive to the quality of care. Howes (1988) analyzed the joint effects of high quality and stable arrangements separately for boys and girls. For girls, academic skills were predicted by stability alone, but for boys both stability and high quality predicted academic skills in first grade. (Both analyses controlled for family characteristics.)

C. RELATIONSHIPS BETWEEN QUALITY AND CHILDREN'S WELL-BEING IN FAMILY CHILD CARE

Although family child care has been subject to less research than center care, family child care research has grappled with extremely wide differences in definitions and measurement of quality, geographic setting, and families' socioeconomic status and racial/ethnic composition. Some variation exists in ages of children enrolled in the samples studied, but the age variation is less than in center child care studies, largely because family child care more commonly serves infants and toddlers and is used much less as a care setting for preschool-age children. We selected eight studies published between 1981 and 1995 for review (see Table 2) and briefly summarize their findings here. A few years ago, we did not have a clear picture of the relationship between family child care quality and children's development (Kontos 1992). The picture has changed, however, with the recent publication of findings from a multisite study, the study of Quality in Family Child Care and Relative Care (Galinsky et al. 1994; and Kontos et al. 1995). These findings are necessarily prominent in our review.

1. Child Outcomes Associated with Higher Quality

Like the center-based studies described earlier, child outcomes measured in family day care include both cognitive and socioemotional development, with special attention given to child-caregiver attachment. Goodman and Andrews (1981) defined quality in terms of educational programming. They found that adding a home-teaching educational program of two to four hours per week in a family day care setting significantly improved children's receptive language, readiness skills, and basic concepts. Howes and Stewart (1987) controlled for family characteristics to show the importance of child care quality on children's level of play with peers and objects. Kontos et al. (1995) measured children's object play, reflecting children's level of cognitive development. Children in regulated care were more frequently engaged in high-level object play than were children in relative care. Other studies have found benefits of higher quality in improved social skills development and personal maturity (Lamb et al. 1988), less aimless wandering and more involvement in activities (Galinsky et al. 1995), more vocalizations to peers (Howes and Rubenstein 1981), and enhanced sociability (Kontos 1994). Kontos et al. (1995) found few behavior problems in their study of children in family child care and relative care, and no differences among the three types of provider.

Strength of the child's attachment with the caregiver has been an important outcome in studies with infants and toddlers. The security and trust that accompany secure attachment allow children to use available resources and materials better. Studies have found greater security of attachment when caregivers are sensitive and responsive (Kontos et al. 1995) and when they have received specialized training (Galinsky et al. 1995). The study of Quality in Family Child Care and Relative Care found no differences in security scores across different types of providers (Kontos 1995). Preliminary findings from the NICHD multisite child care study suggest that secure infant-mother attachment (at 15 months of age) results from a complex interaction of quality of child care and quality of the mother-infant interactions at home. Although analyses of child care quality have not been published as of this writing, the preliminary

report indicated that one of the conditions under which attachment might be adversely affected is poor-quality child care (where caregivers are inattentive) (NICHD Early Child Care Research Network 1996).

Other research has focused on language development. Benefits to children have been seen particularly in receptive vocabulary. Goelman and Pence (1987; and1988) and Goodman and Andrews (1981) found higher levels of language development among the children attending higher-quality family child care. Kontos et al. (1995), however, found that structural and process variables did not predict communicative competence (adaptive language), although ratings by the providers may not have been a reliable method for assessing children's language. Kontos et al. also reported that the percentage of children engaged in high-level peer play and object play was less than expected given the children's ages. The authors concluded that "children in family-based care are not experiencing caregiving environments likely to promote optimal development" (Kontos et al. 1995, p. 163).

2. Quality Dimensions Associated with Positive Outcomes

Important elements of quality found to be associated with positive outcomes in family child care include (1) global quality ratings, using instruments such as the Family Day Care Rating Scale (Goelman and Pence 1988; Howes and Stewart 1987; Kontos 1994; and Kontos et al. 1995); (2) stability of care (Howes and Stewart 1987); (3) training of caregiver (Galinsky et al. 1995); (4) provider intentionality or professionalism and commitment to children (Kontos et al. 1995); (5) caregiver behaviors and characteristics, such as sensitivity and responsiveness (Kontos et al. 1995); and (6) structural features, such as group size (Howes and Rubenstein 1981; and Kontos et al. 1995). Given the small number of studies and the different ways these variables are defined, it is not appropriate to attempt to estimate the relative importance of the different quality dimensions. Nevertheless, it is worth noting the importance of the "intentionality" dimension identified by Kontos et al. (1995). To our knowledge, this characteristic of child care providers has not previously been articulated, yet it has the potential of being a key indicator of quality in family child care (and perhaps in center-based care as well). It is sensible to believe, as Kontos et al.

argue, that providers will provide better quality care along a number of dimension if they have professional preparation, seek out opportunities to learn about child care and child development, actively plan for the experiences their children will participate in, and are actively involved in networks of other family child care providers.

Finally, the study of Quality in Family Child Care and Relative Care has identified the relationship between the provider and the parent as potentially crucial. It is often assumed that relatives are in the best position to provide needed child care. In the Kontos et al. (1995) study, however, the care provided by relatives (usually grandparents) was more likely to be rated as inadequate, and the relative-providers were less sensitive and responsive in interacting with the target child. Rather than placing the onus on relatives per se, the authors focus on the conditions that led to the low ratings of quality: "when adults care for children under less than ideal circumstances (poverty, social isolation, not their chosen profession), the children are less likely to get the warmth and attention that parents rate as important attributes of quality child care" (Kontos et al. 1995, pp. 204-205).

3. Factors that Modify the Relationship Between Quality and Child Outcomes

Several studies have found differential effects of quality as a function of such factors as family socioeconomic status (Kontos 1994; and Kontos et al. 1995), maternal employment (Kontos et al. 1995), and child's gender (Howes and Stewart 1987). Findings are too few, however, to enable us to draw any firm conclusions about the most important moderators of the quality-child outcome relationship. Nevertheless, research to date provides the foundation on which future studies can build.

IV. STRENGTHS AND SHORTCOMINGS OF RESEARCH DESIGNS USED IN STUDYING THE EFFECTS OF CHILD CARE QUALITY

Researchers have used a variety of statistical methods to assess the effects of child care quality on children's well-being. In this section, we discuss the statistical methods within a unified regression framework so that the central features of the various design methodologies can be easily compared. First we review studies that used nonexperimental designs to compare outcomes for children who attended classrooms or centers of different quality. Then, we review studies that compared the outcomes for children who attended child care classrooms randomly assigned to different quality-of-care conditions. In both sections, we highlight the features of the most methodologically sound studies and discuss how research on quality can be improved.

A. NONEXPERIMENTAL DESIGNS

Most studies assessing the effects of child care quality on children's well-being have used nonexperimental designs in which a sample of children attending a representative set of classrooms or centers in particular locales was selected for observation. These studies measured the quality of care the centers provided, as well as developmental outcomes, and compared the outcomes for children who attended higher- and lower-quality centers. We separately discuss the statistical methods in studies using contemporaneous, longitudinal, and pre-post nonexperimental designs.

1. Contemporaneous Designs

Most studies that employed a contemporaneous design measured child care quality and child outcomes at approximately the same time. These studies assessed the contemporaneous effects of child care quality on child outcomes by computing correlation coefficients between the child outcome and center quality measures and determining the statistical significance of the correlation coefficients (see, for

example, Howes et al. 1992). The salient features of this technique can be illustrated using the following regression model:

(1) $Y = \alpha + \beta Q + \epsilon$,

where Y is a child outcome measure, Q is a center or classroom quality measure, α is the intercept term, β is the measure of the effect of the quality measure on the child outcome measure, and ϵ is a mean zero random-error term that is assumed to be uncorrelated with Q, and is interpreted as representing unobserved factors affecting Y.

The parameters of equation (1) can be estimated using ordinary least squares (OLS) techniques.[11] If the quality measure, Q, is a binary variable that takes on the value of one if a center has a particular quality characteristic, and zero otherwise (for example, NAEYC accreditation), then the estimate of β represents the difference in the mean child outcome measure for children who attended centers with and without the quality characteristic. For example, if Q equals one for high-quality centers, and zero for lower-quality centers, then the coefficient represents the difference in mean outcomes between children in high- and lower-quality centers. If Q is a continuous variable (for example, ECERS or ITERS scores), the estimate of β represents the marginal increase in the child outcome measure due to a unit increase in Q. Standard significance tests (t tests) can be used to assess whether the parameter estimate β is statistically significant (that is, whether the child care quality measure is a significant predictor of the child outcome measure).

The model in equation (1) can be extended to include multiple quality measures. For example, Howes and Olenick (1986) estimated a variant of the following model:

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[11]The OLS estimate of β is not exactly the correlation coefficient between Q and Y, but can be written as the correlation coefficient multiplied by the standard deviation of Y divided by the standard deviation of Q. We present the OLS model in equation (1) so that the statistical methods used to estimate the effects of child care quality on child outcomes in all the reviewed studies can be discussed within a unified framework.

(2) $Y = \alpha + \beta_1 Q_1 + \beta_2 Q_2 + \epsilon$,

where Q_1 is a binary variable that takes on the value of one if a child attended a high-quality center, Q_2 is a binary variable that takes the value of one if the child did not attend a day care center, and the binary variable signifying a low-quality center is omitted from the model. In this model, the coefficient β_1 represents the difference between the mean outcomes of children who attended high- and low-quality centers, and β_2 represents the difference between the mean outcomes of children who attended no center and those who attended low-quality centers. Standard statistical tests (t tests and F tests) can be conducted to test hypotheses that child outcomes were the same for children attending high- and low-quality and no centers.

Estimating the effects of center quality on child outcomes using equations (1) and (2), however, involves a serious potential problem. Child background and family characteristic measures that are correlated with the child outcome measures may differ for children who attend centers of different quality, as Hayes et al. (1990) and others have noted (see discussion in Section III). In this case, the coefficient estimates on the quality variables will capture not only the potential effects of center quality on child outcomes but also the effects of omitted child characteristic variables on child outcomes. For example, if highly educated parents are more likely than less educated parents to send their children to high-quality centers, and parental education has a positive effect on child outcomes, then the estimate of β in equation (1) will capture both the effects of center quality and parental education on child outcomes. The estimated effects of center quality on child outcomes would then be overstated.

The potential bias in the OLS estimate of β in equation (1) arises if the quality variable, Q, is (positively) correlated with the error term, ϵ. This bias is denoted in the statistical literature as "sample selection" or "endogeneity" bias. Several studies have attempted to control for this bias by including child and family background characteristics as control variables in the regression models (see, for example, Cost, Quality, and Child Outcomes Study Team 1995; Howes and Olenick 1986; Kontos 1991, and Phillips et

al. 1987). These studies attempt to "purge" the correlation between Q and ϵ by including control variables in the model to capture that part of ϵ that is correlated with Q. Since the remaining model error term is uncorrelated with Q, OLS methods yield unbiased estimates of the effects of center quality on children's well-being.

The basic model estimated in these studies is an extension of equation (1) and can be written as follows:

(3) $Y = \alpha + \beta Q + X'\delta + \epsilon,$

where X is a vector of control variables and δ is the vector of regression coefficients for the control variables. The vector of control variables differs by study, although the vector usually includes measures of (1) child demographic characteristics (age, gender, race), (2) parents' background characteristics (educational attainment, occupation), (3) family structure and behavior patterns, and (4) the child's child care history. Many studies also include terms in the model formed by interacting (multiplying) the quality measures with the control variables to assess whether the effects of center quality differ by subgroups defined by the child and family background characteristic variables.

Researchers usually estimate the parameters in equation (3) in two steps. First, they select a limited set of control variables to include in the regression models by regressing the quality measures on all constructed control variables and selecting those control variables with the most predictive power. Second, OLS methods are used to estimate the parameters in the model. The OLS estimate of the coefficient β in equation (3) signifies the regression-adjusted effect of the center quality measure on the child outcome measure.[12]

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[12]The researchers generally include only a limited set of control variables in the models because they believe that this approach produces more precise unbiased estimates of the effects of center quality than does an approach where control variables that are not highly correlated with the quality measures are also included in the models. It is true that the center quality impact estimates will be similar whether or not the models include control variables that have low correlations with the center quality measures. However, the inclusion of these control variables may produce more precise impact estimates if they are statistically significant predictors of the child outcome measures. Hence, the optimal estimation approach would be to include in the models those control variables that are highly correlated with either the quality measures or the outcome measures.

The recent CQCO study (Cost, Quality, and Child Outcomes Study Team 1995) is the most methodologically sound study using a contemporaneous nonexperimental design.[13] It estimated a model similar to equation (3) using data on a large sample of more than 826 children who attended 181 centers in four states. The study team categorized the 181 centers as centers of poor, mediocre, or high (developmentally appropriate) quality, and included binary variables in the model signifying the quality of each center. They calculated predicted (expected) outcomes for a child with average characteristics who had attended each type of center, and conducted statistical tests to determine whether the differences in these predicted outcomes were statistically significant. In addition, they estimated the effects of center quality for subgroups defined by child and family background measures.

Several other studies also have estimated models similar to equation (3) (see, for example, Dunn 1993; Howes and Olenick 1986; Kontos 1991; and Phillips et al. 1987). We believe, however, that the results from these studies are difficult to interpret. These studies used hierarchical regression models, where groups of control variables were sequentially added to the control variable set, and where the parameters of the model were estimated each time a new group of variables was added. For example, Phillips et al. (1987) entered children's age into the equation first, and then entered the family background variables, child care history variables, and the center quality measures. After each round of model estimation, the researchers conducted statistical tests to determine whether the new group of variables significantly increased the proportion of variance of the outcome measure explained by the model (that is, the model R^2). Thus, the statistical significance of the *change* in the R^2 value was computed after each new group of variables was added to the model, and the researchers used these results to assess the degree to which the added group of variables affected the child outcome measures.

A serious problem with this procedure, however, is that the degree to which the R^2 values change when new groups of variables are added critically depends on the *order* in which the groups of variables are added. For example, center quality variables may be significant predictors of child outcomes when

[13]This study is designed to be a longitudinal study, but thus far only the contemporaneous findings have been reported.

they are the first group of variables included in the equations, but they may have little effect when they are added to the model after the child and family background variables have been included. The order of variable inclusion matters since the degree to which the R^2 statistic changes depends on the covariance between the new group of variables and the control variables previously added to the model. The change in the R^2 value will be small if the covariance between the two groups of variables is large, and will be large if the covariance is small. Thus, results presented in these studies are valid for a particular order of variable inclusion but may not be valid for a different order.[14]

We believe that the proper analytic regression approach is to include *simultaneously* all the control variables in the model, and to assess the joint significance of each group of variables, while controlling for the effects of all other groups of variables (as was done in the CQCO study). This procedure is appropriate for assessing whether the center quality variables are significant predictors of child outcomes after controlling for the effects of family background factors, and vice versa. In addition, we believe that authors should use the coefficient estimates from these regression models to predict what the difference in outcomes would be for a child with average characteristics who would attend centers of different quality, so that the magnitude of the effects of center quality on children's well-being can be assessed.

2. Longitudinal Designs

Studies that have employed longitudinal designs have attempted to assess the *long-term* impacts of day care experiences of varying quality on child outcomes. These studies obtained follow-up child assessment data for children who had participated in good- and poor-quality child care. The follow-up child assessments were conducted at varying periods after children's child care experience. Thus, in terms of equation (1), the center quality measures, Q, were obtained when the children were enrolled in day care, and the child outcome measures, Y, were usually obtained when the children were in elementary school.

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[14]The statistical tests pertaining to the joint significance of the *last* group of variables included in the models are correct, however, since these tests incorporate the influence of all other control variables on the child outcome measures. However, the statistical tests pertaining to the joint significance of each of the other groups of variables are *incorrect* because those tests do not take into account the effects of all other variable groups on the child outcomes.

The models estimated in the studies using a longitudinal design are similar to the models estimated in the studies using a contemporaneous design. The researchers usually began their analyses by calculating the correlation coefficients between the center quality and child outcome measures. Then, they estimated regression models similar to equation (3), where child and family background variables were included as control variables in the models. The control variables were usually measured at the time the children attended child care and are similar to the control variables used in the studies employing a contemporaneous design.

The longitudinal studies have two shortcomings. First, sample selection bias in the contemporaneous estimates of the impact of child care quality are likely to be compounded in the longitudinal impact estimates because most longitudinal studies do not control for events related to child outcomes and center choice that occurred during the follow-up period. For example, if children who attend high-quality centers are more likely than children who attend lower-quality centers to subsequently attend better schools, then the estimated impacts of center quality on child outcomes will be confounded with the effects of these events. Consequently, the estimated center quality impacts are likely to be biased upward. We believe that more complete follow-up data on child experiences and environmental changes should be obtained in future studies employing longitudinal designs, because these events are likely to have a substantial effect on child developmental outcomes.

Second, all the longitudinal studies we have reviewed that estimated regression models similar to equation (3) used hierarchical regression techniques in which groups of control variables were added sequentially to the models. As discussed previously, this procedure yields estimates that are difficult to interpret. We believe that future work should present parameter estimates and predicted child outcomes for centers of varying quality when the control variables are included simultaneously in the regression models.

3. Pre-Post Designs

Studies that used pre-post nonexperimental designs assessed how *changes* in center quality affected children's well-being. These studies either (1) compared the outcomes of separate cross-sections of children before and after a center quality change (pre-post cross-section designs), or (2) compared the outcomes of a longitudinal sample of children who experienced a change in day care quality with the outcomes of those who did not (pre-post longitudinal designs).

The most important study using a pre-post cross-section design is Howes et al. (1995), which assessed how changes in Florida's child-staff ratio requirements in child care facilities affected the quality of children's development. Florida legislation in 1991 changed child-teacher ratios for infants from 6:1 to 4:1 and for toddlers from 8:1 to 6:1; the changes went into effect in 1992. To assess how these changes affected child outcomes, Howes et al. collected data in 1992 on a cross-section of children who attended approximately 150 centers in four Florida counties before the requirement changes; they also collected data on a separate cross-section of children who attended the same centers two years after the changes went into effect. They estimated models similar to equations (1) and (3), where the quality variable, Q, was a binary variable equal to one if the data point was collected before the legislation went into effect, and equal to zero otherwise. Hence, the estimate of the coefficient β represents the (regression-adjusted) difference in the mean outcome measure between children in the 1992 and 1994 samples.

The OLS estimates of the effect of center child-staff ratio on child outcomes in the Howes et al. study are unbiased if there were no systematic unmeasured differences between the characteristics of the children in the 1992 and 1994 cross-sections except that the children in the 1994 cross-section enrolled in classrooms with higher child-staff ratios. This is a plausible assumption, because data on the two groups of children were collected only two years apart. Therefore, the average characteristics of the two groups of children and the environmental conditions they faced were probably similar.

Studies using pre-post longitudinal designs compared the outcomes of children in child care who experienced a change in the nature of their care with the outcomes of those who did not experience a

change. For example, Howes and Hamilton (1993) obtained follow-up data on a sample of children in five centers. They assessed whether children who changed their child care setting, lost their primary teacher, or had a change in the qualitative nature of their relationship with their teachers had different outcomes than children who had a more stable child care experience. They estimated models similar to equation (1), where the quality measure, Q, was a binary variable signifying whether the child had a change in the nature of his or her care or a continuous variable assessing the number of such changes. They estimated separate models at various follow-up points. This procedure produces unbiased estimates of the effect of quality-of-care changes if there are no differences between the characteristics of children who had care changes and those who did not. It is likely, however, that differences exist between these groups of children. Hence, we do not believe that these studies yield reliable center quality impact estimates.[15]

B. EXPERIMENTAL DESIGNS

The most rigorous design methodology that can be used to estimate internally valid impacts of center quality on children's well-being is an experimental or randomized design, where classrooms in a sample of day care centers are randomly assigned to different quality-of-care groups, and where children requiring day care are randomly assigned to the classrooms. Randomization ensures that there are no systematic observable or unobservable differences between children assigned to the different classrooms, except for the quality of care that they receive, and that there are no systematic differences between the quality of teachers assigned to the different quality-of-care groups. Thus, randomization ensures that the quality measures in equation (1) are uncorrelated with the error term in the equation. Hence, simple differences in the mean values of classroom outcomes for classrooms assigned to the various treatment groups will yield unbiased quality impact estimates, and the associated t-tests indicate statistical significance.

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[15]As we discuss later, a more appropriate estimation strategy is to estimate a *fixed-effects* model, where differences in the baseline and follow-up outcomes are compared for children who had a quality change during the follow-up period with the outcomes of children who did not experience a change. This procedure removes any individual-specific time-invariant differences between children in the two groups.

Because parents or child care staff members may want to select specific teachers for certain children, it is seldom feasible for children to be randomly assigned to classrooms. Therefore, a more realistic design is to allocate children to specific classrooms (either through parental or center staff choice, or randomly) and then randomly assign classrooms to different quality-of-care conditions. This design, however, may produce less-precise estimates of the effects of day care quality for a given sample size than a design in which all children are also randomly assigned to classrooms, because there is a greater chance that the average characteristics of children will differ across classrooms. Hence, the standard errors of the estimated effects of day care quality must take into account that a different allocation of classrooms to the quality-of-care groups could produce different results.

Although not primarily focusing on child outcomes, Love et al. (1992) conducted a study that illustrates some of the strengths and problems of using an experimental design to assess the impacts of structural variables on classroom dynamics and children's behavior. They randomly assigned 112 classrooms in 62 agencies in California to one of three child-staff ratio conditions: 8:1, 9:1, or 10:1. Children in the child care facilities were not randomly assigned to classrooms, but were enrolled in specific classes prior to the time classroom randomization took place. Average classroom outcomes for classrooms assigned to the three evaluation groups were compared to assess whether increasing child-staff ratios substantially affected dimensions of children's behavior.

Randomized designs are, in theory, the most effective designs for obtaining reliable impacts of a policy intervention. Because these designs are often difficult to implement, however, they usually have practical limitations. Program staff members are often unwilling to participate in randomized studies. Thus, many studies employing randomized designs use only those program sites that agree to participate. For example, the classrooms that participated in the study by Love et al. were volunteers. The problem with the nonrandom selection of sites is that it is often difficult to assess how evaluation results can be generalized to broader populations or sites. The randomization process or method of introducing the intervention could also create contaminating effects, which could be confused with the impact of the

evaluation. For example, Love et al. found that their study was not as successful as planned in testing the full range of ratios to which classrooms were assigned, since classrooms did not always operate at their assigned ratios. As another example, if classrooms within a center are randomized to different quality-of-care groups, then the positive effects of a high-quality classroom could "spill over" into lower-quality classrooms, thereby producing impact estimates that are biased downward. Therefore, caution must be used in interpreting the impact estimates from experimental designs.

C. RECOMMENDATIONS FOR FUTURE RESEARCH

In this section, we discuss our recommendations for future research on the effects of child care quality on children's well-being. Although we favor experimental designs modeled after the National Day Care study's substudy (Ruopp et al. 1979), we recognize that they are extremely difficult and expensive to implement. Because nonexperimental designs are more practical, they are likely to prevail in the research of the foreseeable future. We have two recommendations for future studies employing nonexperimental methods to estimate center quality impacts:

1. For studies employing contemporaneous or longitudinal designs, models should be estimated that use established statistical methods that correct and test for systematic unobservable differences between the characteristics of children who enroll in centers of different quality or in no centers.

2. Additional studies should be conducted that use pre-post designs, where the child outcomes of a cross-section of children who attended child care before an exogenous change in center quality regulations are compared with the child outcomes of a separate cross-section of children who attended child care after the changes went into effect.

1. Use Methods to Correct for Sample Selection Bias Due to Unobservable Factors

Earlier, we reviewed the basic statistical procedures used by studies employing nonexperimental contemporaneous and longitudinal designs to assess the impacts of center quality on children's developmental outcomes. In our review, we focused on studies that estimated the impacts of center quality while controlling for potential observable differences between the characteristics of children who attended centers of different quality. We argued that it is important to adjust for these observable differences so that

the impact estimates reflect the "true" effect of center quality on child outcomes, and not the effect of differences in child characteristics by center choice that are correlated with the outcome measures.

Regression models offer one means of controlling for systematic differences between the types of children who attend centers of different quality, *when all such differences can be measured*. It is plausible, however, that *unmeasured* systematic differences that affect the outcomes of interest remain between children who enroll in centers of different quality. In the reviewed studies, the regression models generally yield R^2 values of only about 10 or 15 percent, suggesting that a large proportion of the variance of the child outcome measures is not being explained by the control variables. Hence, important unobserved factors exist that affect child developmental outcomes, and it is likely that these unobserved factors are correlated with parental decisions about the type of day care to provide for their children. In this case, OLS estimation procedures will yield biased center quality impact estimates, since the quality measures will be correlated with the error term in the regression models (even after controlling for observable child characteristics).

Several statistical procedures developed in the past 20 years can be used to attempt to correct and test for sample selection bias when regression models are used to estimate the impact of a policy intervention, albeit with mixed results. We recommend that these procedures be applied in future research to determine whether the positive effects of center quality on child outcomes generally found in previous studies remain after both observable and unobservable differences in types of children attending centers of different quality are accounted for in the regression models.

The two most popular approaches to correct and test for sample selection biases are (1) the two-stage econometric procedure developed by Heckman (1976; and 1979) when cross-section data are available, and (2) fixed-effects (difference-in-difference) procedures when longitudinal data are available. Here, we discuss the main features of these procedures.

The Two-Stage Method. The two-stage method first models and estimates the decision by parents to send their children to a day care center of a particular quality (or not to use day care services). It then

includes in the regression equations variables that are functions of the estimated probabilities of a child receiving a particular quality of center care.

In the first stage, a model is specified to explain how parents decide whether to send their child to a high- or lower-quality center. For example, let *IND* be an index of the net benefits to the parents of sending their child to a high- versus lower-quality center, and assume that *IND* is a linear function of observed variables W and unobserved variables η. Then:

(4) $IND = W'\theta + \eta$.

In this function, the parents will send their child to a high-quality center if the index function exceeds zero and will send their child to a lower-quality center otherwise. Parameter estimates in equation (4) are obtained by using probit binary choice statistical procedures and are then used to obtain the predicted probability that a parent chooses a center of a particular quality.[16]

Heckman corrects and tests for sample selection bias by using a function of the predicted probability that a parent enrolls her child in a high-quality center (known as Mills ratio). This is done to obtain an estimate of the portion of the error term in the child outcome equation that is correlated with the center quality binary variable, and to include the Mills ratio as an additional regressor in the outcome equations, thereby eliminating the correlation between the quality measure and the error term. Because the remaining error term is no longer correlated with the center quality measure, OLS methods will be consistent (unbiased in large samples).[17]

The Heckman procedure is theoretically sound. However, obtaining reliable impact estimates depends on successful identification of the child outcome equations. The outcome equation is identified

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[16]Equation (4) can easily be generalized to include multiple center choices.

[17]The two-stage econometric technique developed by Maddala and Lee (1976) is another commonly used method to control for sample selection bias. This approach also uses a probit model to obtain predicted probabilities of center choice. However, instead of including an estimated Mills ratio term for children in the child outcome equations, the approach replaces the quality indicator variable with the predicted center choice probabilities. This "instrumental" variable approach can also be used if the quality measure is a continuous variable instead of a binary variable.

successfully if it is possible to distinguish between the coefficients of the outcome equation and the coefficient in the equations that predict center choice. The usual identification method is to specify variables that affect center choice but that are uncorrelated with the unobservable variables affecting child developmental outcomes (that is, at least one variable in W must be excluded from the control variable set in the outcome equations). In practice, such variables are often difficult to specify. Thus, whether these sample selection bias models can be estimated successfully will depend on whether such variables can be found and on the child outcome being evaluated. An example is a variable representing the distance that the family lives from a high-quality day care center. This variable is likely to be correlated with whether or not a child attends a high-quality day care center, but it may not be directly correlated with unobservable factors affecting child outcomes. In studies of the effects of child care quality using low-income populations, an identifying variable would be one signifying whether the locales in which sample members live have legislated a workfare program where welfare recipients must seek employment or enroll in education or training programs as a condition of their welfare receipt. This variable would predict whether a child attends child care but would not be directly related to child outcomes.

The Fixed-Effect Method. When longitudinal data are available, researchers often use fixed-effect (difference-in-difference) estimation methods to correct for potential selection bias when assessing the effectiveness of a policy intervention. In our context, the fixed-effect model can be written as follows:

$$(5) \quad Y_{it} = \alpha_i + \beta Q + X_{it}' \delta + u_{it},$$

where Y_{it} is a child outcome measure of child i in time t, X_{it} is a vector of child characteristics, and Q is the quality of the center in which the child enrolled between the baseline and follow-up data collection points. The parameter α_i is an unobserved individual fixed-effect that does not vary with time and that may be correlated with Q and X. The vector of unobservables u is assumed to have mean zero and to be uncorrelated with Q and X.

The fixed-effects model allows for the possibility that sample members who enrolled in some types of centers may have systematically different unobservable individual fixed-effects than sample members who enrolled in other types of centers (or no centers). The fixed-effect parameters capture that part of the total error term that is correlated with the quality and observable child characteristic variables. The remaining error, u, is assumed to be uncorrelated with the center quality, control variables, and fixed-effect parameters. Hence, OLS estimation techniques will yield unbiased center quality impact estimates if the fixed-effect parameters can be estimated.

The fixed-effects model can only be estimated if longitudinal data are available, since multiple observations on the same child are needed to estimate (identify) the individual fixed-effect parameters. The model is usually estimated in two stages:

1. Data on the outcome variables of interest and the control variables are collected *before* sample members enroll in their centers (or before they change centers) and at a follow-up point (or at multiple follow-up points).

2. The difference in the outcome measures between the follow-up and baseline periods is regressed on the difference in the control variables between the two periods using OLS techniques. This procedure corrects for sample selection bias because differencing removes the individual fixed effects. The estimate of the coefficient, β, represents the regression-adjusted difference in the change in outcomes between children who enrolled in centers of different quality. Standard statistical tests (t-tests) can be used to determine whether differences in the outcome changes are statistically significant.

The fixed-effect method can be employed *only* if data can be obtained before a change in center quality status occurs. Center quality status must change for some sample members between the baseline and follow-up periods, so that the quality measures remain in the differenced regression model. Because of this data requirement, fixed-effects techniques may not be appropriate for certain studies.

Another potential limitation of the fixed-effects approach is that it assumes that the average difference between the unobserved individual fixed effects for children who attend centers of different quality does not vary with time. It is possible, however, that these unobserved differences may change over time. For

example, the unobservable factors affecting growth rates in child development measures may differ for children attending high- and lower-quality centers.

2. Conduct Additional Studies Employing Pre-Post Cross-Sectional Designs

The study by Howes et al. (1995), which assessed how changes in Florida's child-staff ratio requirements affected child development outcomes, compared the child outcomes of separate cross-sections of children who attended child care before and after the changes in regulations went into effect. We believe that this pre-post, quasi-experimental study design is effective for obtaining reliable estimates of the impact of child care quality on children's development if the data collection points for the separate cross-sections of children are not too far apart. In this case, the characteristics of children who attend child care centers before and after an exogenous change in center quality regulations are likely to be similar on average; therefore, uncontaminated estimates of center quality impacts can be obtained.

We also believe that this pre-post design may be more effective for obtaining reliable estimates than contemporaneous and longitudinal designs. This is because the characteristics of children who attend child care centers of different quality soon before and soon after an exogenous change in center quality are more likely to be similar, on average, than those of children who attend centers of different quality because of parental choice. We believe that additional effort should be devoted to obtaining center quality impact estimates using these pre-post designs. The use of these designs is probably limited, however, because few instances exist where center quality within a locale is changed due to legislative or other exogenous reasons.

TABLE 1

CENTER CARE STUDIES THAT EXAMINED QUALITY OF CARE AND CHILD OUTCOMES

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Studies Using Contemporaneous Designs						
Cost, Quality, and Child Outcomes Study Team (1995)	826 children 181 centers	15% African American 68% white 6% Hispanic 4% Asian 63% of mothers have less than bachelor's degree	Age 4	Contemporaneous design Observational measures of classroom quality Direct assessments, teacher ratings, and self-reports of child outcomes	Receptive language Prereading skills Premath skills Self-perceptions of competence Level of social play Attitudes toward child care Social skills	Higher classroom quality index was associated with: Greater receptive language ability Higher premath skills More advanced social skills More positive self-perceptions Effect of quality on receptive language was greater for minority children
Dunn (1993)	60 children 30 classrooms in 24 centers	90% white 10% African American Middle socioeconomic status 77% two-parent families	Ages 3 to 5	Contemporaneous design Observational assessment, staff interviews, and questionnaires to measure classroom quality Direct assessment, teacher ratings, and child achievement tests to measure child outcomes	Sociability Social adjustment Social play Cognitive development and intelligence Cognitive play	Children with married parents and those attending centers that offered less variety and more guidance (or more "total limits") were rated as better socially adjusted; children attending centers that provided more total limits had higher levels of complex social play. Children attending classrooms with higher overall quality and whose caregivers had a child-related college major and less experience in the center scored higher on a test of intelligence. Child-staff ratio and group size did not predict children's social and cognitive development.
Field (1980)	80 children Four center-based preschool classrooms	100% white Middle socioeconomic status	Ages 3 to 4	Contemporaneous design (observational and child data collection over a nine-month period) Observational assessment of quality on two dimensions Direct assessment of child outcomes	Peer interactions Play behaviors (fantasy play, associative-cooperative play)	Children attending classrooms that had low teacher-child ratios and partitioned, special play areas exhibited more optimal behaviors (including interactions with peers, verbal interactions, fantasy play, and associative-cooperative play).

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
File and Kontos (1993)	28 children 6 to 12 center classrooms (exact number not provided)	Demographic characteristics not provided 50% had mild or moderate cognitive and/or speech and language delays.	Ages 2½ to 6	Contemporaneous design (observational and child data collection over a two-week period) Observational assessment of quality Direct assessment of child outcomes	Cognitive play level (functional, constructive, and dramatic play) Social play level (solitary, parallel, and interactive play)	Positive teacher interactions with children, a characteristic indicative of high-quality classrooms, were related to a higher level of children's social play. Less teacher involvement in routine activities, less watching, less support of cognitive play, and more overall teacher uninvolvement were also related to higher levels of social play. Children's experiences with their teachers were not related to their level of cognitive play.
Goelman and Pence (1987, and 1988)	105 children 53 centers 52 family day care providers	Predominantly white (Canadian) Range of socioeconomic status represented 50% two-parent families	Approximately 3 to 4 years of age (ages not provided)	Contemporaneous design (observational and child data collection over a one-year period) Observational assessment and parent ratings of classroom quality Direct assessment of child outcomes	Language development Peer interactions Play activities (solitary, cooperative)	Among children attending center-based care, quality of care did not predict language development scores. Children in center-based care engaged in more high-quality "information activities" than children in family day care. However, for children in family child care, the amount of information activities was not related to quality.
Hestenes, Kontos, and Bryan (1993)	60 children 26 centers 30 classrooms	Range of social classes represented Race/ethnicity of children not provided	Ages 3 to 5	Contemporaneous design (observational and child data collection on two separate occasions) Observational assessment of classroom quality Direct assessment of child outcomes	Emotional expression (positive versus negative affect, intensity of affect, duration of affect) Temperament (approach, adaptability, intensity, mood, and rhythm)	Low levels of classroom engagement by teachers predicted more intense negative affect among children; children whose teachers showed high levels of classroom engagement displayed more intense positive affect, controlling for temperament and child demographics.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Holloway and Reichhart-Erickson (1988)	55 children 15 centers	4% African American 94% white 2% Asian 91% two-parent families Predominantly middle socioeconomic status	Age 4	Contemporaneous design (observational and child data collection over a three-week period) Observational measures of classroom quality Direct assessment of child outcomes	Free-play activities Social reasoning and problem solving Peer interactions	Children engaging in high-quality interactions with teachers and children attending centers with lower child-teacher ratios scored higher on a test of social reasoning skills. In centers that were better able to accommodate groups of varying sizes, had smaller classes, and offered a variety of age-appropriate materials, children scored higher on a test of social reasoning skills. In centers with a more spacious layout, children spent more time in focused, solitary play and less time observing. Quality indicators were not significantly related to negative or positive social interactions with peers.
Howes and Olenick (1986)	89 children Eight centers	10% African American 70% white 13% Hispanic 7% Asian (based on race/ethnicity of father) 69% 2-parent families	Ages 1½ - 3	Contemporaneous design Observational assessment and caregiver reporting of classroom quality measures Direct assessment (in home and center) and parent ratings of child outcomes	Compliance Resistance Self-regulation	Children attending high-quality centers were more compliant and less resistant and were more likely to self-regulate (or refrain from touching food and forbidden new toys). Quality of care predicted self-regulation and resistant behavior among boys but not girls.
Howes, Phillips, and Whitebook (1992)	414 children • 68 infants • 175 toddlers • 171 preschoolers 233 center classrooms	Full range of social classes represented 21% African American 73% white	Ages 1 to 4½	Contemporaneous design Observational assessment of quality Direct assessment of children	Attachment with teacher Social orientation Interaction with peers	Children in classrooms rated higher on "appropriate caregiving" were more likely to be classified as secure (but not as avoidant or ambivalent). Children in classrooms rated higher on "developmentally appropriate activities" were more likely to be both adult and peer oriented.
Howes and Rubenstein (1981)	40 children Eight centers 16 family day care homes	33% African American, Hispanic, or Asian 67% white Predominantly two-parent families Middle socioeconomic status	Ages 1½ to under 2	Contemporaneous design Observational assessment of classroom quality Direct assessment and observer ratings of child outcomes	Peer social behaviors Peer social interaction Structure of peer play	The greater use of nonportable objects (indicative of a quality environment) in centers was positively related to the level of interactive play. No overall differences in the frequency of socially directed peer behaviors were present between family day care and center care.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Kontos (1991)	100 children 10 centers	Predominantly white Range of socioeconomic status and urban/rural families represented 57% two-parent (married) families	Ages 3 to 5	Contemporaneous design (observations and child assessments collected over a one-day period) Observation and state licensing instruments used to assess quality Caregiver ratings and child performance on standardized tests used to assess child outcomes	Cognitive development Language development Social development	Family background variables were significantly related to several measures of children's cognitive and language development. Overall quality (a measure of a minimum level of quality) predicted better social adjustment scores and fewer behavior problems among children, controlling for family background and child care experience. Age of entry into child care and duration of the child care experience were not significant predictors of child development outcomes.
Love, Ryer, and Faddis (1992)	112 center classrooms 62 agencies	37% African American 19% white 32% Hispanic 13% Asian 23% limited English proficient Families eligible for child care subsidy (average of only 1.4 children per agency paid full fee)	Ages 3 to 5 (94% 3- and 4-year-olds)	Pre-post design; contemporaneous Classrooms randomly assigned to change ratio after fall data collection Contemporaneous assessment of classroom quality and child outcomes Teacher ratings of behavior problems Observer ratings of stress behaviors	Behavior problems Stress behaviors Crying and fighting Involvement in activities	In classrooms that were more developmentally appropriate, children showed less stress and less crying and fighting. In classrooms that were more developmentally inappropriate, children were more uninvolved in classroom activities and showed higher levels of stress. When caregivers were attentive and encouraging, children showed less stress; when caregivers were more harsh, critical, and detached, children showed higher levels of stress. In classrooms rated higher on scheduling, safety, and health, there was less crying and fighting.
McCartney (1984)	166 children Nine centers	80% black Bermudians 20% white Bermudians 84% spent most of work week in day care by age 2	Ages 3 to 5	Contemporaneous design (observational and child data collection over a four-month period) Observational measures of classroom quality Direct assessment of child outcomes Caregiver ratings of child outcomes	Verbal intelligence Verbal interaction with caregivers Verbal interaction with peers Language development	Children attending centers with higher overall quality ratings were more likely to have greater verbal intelligence and language development, controlling for family background, age of entry in care, and number of hours in care. Children who attended centers that allowed greater levels of child-initiated conversation, had many visitors, had less noise, and provided little free-play time scored higher on tests of language development.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
McCartney, Scarr, Phillips, and Grajek (1985)	166 children (comparison group: 72 children) Nine centers	78% black Bermudians 22% white Bermudians Comparison group (100% black Bermudians)	Ages 3 to 6	Contemporaneous, comparison group design (observations and child data collection over a four-month period) Observational assessment of classroom quality Direct assessment of child performance on standardized tests; parent and caregiver ratings used to assess child outcomes	Cognitive skills Receptive language Communication skills Sociability Considerateness Dependency Intelligence Task orientation	Low-income children attending a high-quality day care intervention program had better language skills and were more considerate and sociable, compared with children attending other center programs of lower, but varying, quality. Findings hold when children attending the high-quality program are compared with a group with similar family backgrounds.
Peterson and Peterson (1986)	66 children (24 in home care) Four centers	Predominantly white Predominantly middle socioeconomic status	Ages 3 to 5	Contemporaneous design Observational assessment of classroom quality Direct assessment of child outcomes	Parent-child interaction Verbal communication Compliance	Children attending low-quality centers performed worse on sustained verbal interactions and compliance with task-oriented instructions than either children attending high-quality centers or children receiving maternal care in the home; no differences existed in these two outcomes for children receiving either high-quality center care or maternal care.
Phillips, McCartney, and Scarr (1987)	166 children Nine centers	78% black Bermudians 22% white Bermudians 68% from two-parent families 85% spent most of work week in day care by age 2	Ages 3 to 5¼	Contemporaneous design (observational and child data collection over a four-month period) Observational assessment and staff reporting of quality Teacher and parent ratings of child outcomes	Sociability Considerateness Dependence Intelligence Task orientation Aggression Hyperactivity Anxiety	Children in centers with higher overall quality were more socially developed in considerateness, sociability, intelligence, task orientation, and anxiety, controlling for age at entry, time in child care, and family background. Children having greater levels of verbal interaction with caregivers were more considerate, sociable, intelligent, and task-oriented. In centers with directors who had greater levels of experience, children were less aggressive and anxious but also were less considerate and sociable.

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TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Schliecker, White, and Jacobs (1991)	100 children 10 centers	Predominantly white Range of socioeconomic status represented 63% two-parent families	Age 4	Contemporaneous design (observational and child data collection over a two-week period) Observational assessment of classroom quality Direct assessment of child outcomes	Language development and comprehension	Day care quality (measured dichotomously) and socioeconomic status (a combined measure of income, occupation, education, and family structure) both significantly predicted vocabulary comprehension; day care quality may be particularly important for single-parent, female-headed households.
Studer (1992)	95 children in families currently using child care center or nursery at time of the 1986 National Longitudinal Study of Youth	All two-parent families	Ages 3 to 4	Contemporaneous design Parental report of quality through survey responses Direct assessment of child outcomes	Receptive language	Special training of caregiver, group size, and ratio were unrelated to receptive language ability. Composite quality index was positively associated with receptive language ability only for low-income subsample. Composite quality index was negatively related to receptive language ability for lower-middle-income group.
Vandell and Powers (1983)	55 children Six centers	White Middle socioeconomic status Two-parent families Attended day care an average of two years	Ages 3 to 4	Contemporaneous design Observational assessment of classroom quality Direct assessment of behavior	Interaction with peers Interaction with adults Vocalization with peers Vocalization with adults Solitary play Unoccupied behaviors	Children attending centers rated as high quality were more likely to have positive interactions and vocalizations with adults. Children attending low-quality centers were more likely to engage in solitary play and aimless wandering. No differences were found in peer-directed behaviors and interactions in centers of varying quality.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Studies Using Longitudinal Designs						
Field (1991)	56 children Six centers Study 1: 28 children Study 2: 56 children	Heterogeneous sample by race/ethnicity (including African American, white, Hispanic; percentages not given) Middle socioeconomic status, highly educated families	Average age 11½ at follow-up. (Children began day care when less than 2 years old and continued for average of 2.7 years.)	Longitudinal design (parent reports of child's early care experience used as baseline data) Caregiver reporting of classroom quality measures Direct assessment and parent and teacher ratings of child outcomes	School grades Test scores Assignment to gifted program Work/study habits Leadership Emotional well-being Adult/child relations Peer relations, attractiveness, assertiveness, aggressivity, popularity	Children who had spent more time in high-quality day care were more likely to show more physical affection during peer interactions, to be assigned to the gifted program, and to receive higher math grades.
Howes (1990)	80 children (same children examined in Howes and Olenick 1986) Eight centers (estimate)	9% African American 74% white 13% Hispanic 1% Asian 76% two-parent families	Ages 3 to 7 (primarily) Began at ages 1½ to 3 (see Howes and Olenick 1986)	Longitudinal design Observational assessment and caregiver reporting of classroom quality measures Direct assessment and parent and teacher ratings of child outcomes	Compliance, resistance Self-regulation Social adjustment/peer interactions (social play, social pretend play, positive affect)	Preschool children attending high-quality centers engaged in more social pretend activities, displayed more "positive affect" relative to angry and distressed behavior, and were rated by teachers as having sociable relations with peers. Kindergarten children who entered lower-quality centers as infants were rated by teachers as more distractible, less task-oriented, and less considerate, compared with children who entered higher-quality centers as infants. Among children enrolled as infants, child care quality (measured through teacher socialization practices) best predicted child outcomes; among children enrolled as toddlers or preschoolers, family socialization practices best predicted child outcomes.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Howes (1988)	75 children enrolled in laboratory elementary school	12% African American 69% white 12% Hispanic 6% Asian Mothers' median education level 14 years 70% two-parent families	Child care experience at age 4 Followup at first grade	Longitudinal design Observational measures of classroom quality Teacher ratings of child outcomes	Academic progress School skills (independence, group skills, participation skills) Behavior problems	For girls, stable child care arrangements predicted academic skills, controlling for family characteristics. For boys, stable arrangements and high-quality care predicted academic skills, controlling for family characteristics. For both boys and girls, high-quality care predicted enhanced school skills and low behavior problems.
Howes and Hamilton (1993)	72 children (48 at followup) 5 centers (and one large family day care home) at start; 54 centers over course of study	14% African American 61% white 25% Hispanic or Asian 67% middle socioeconomic status	Ages 1 to 2 Followup at ages 4 to 5	Longitudinal design Observational assessment of quality Direct assessment of child outcomes	Social competence with peers (complex play, prosocial, gregarious, aggressive, and withdrawn behaviors)	Children having more changes in teachers were rated as lower in positive and gregarious behaviors and higher in social withdrawal and aggression. Children who had secure teacher-child relationships (or teacher-child relationships that *changed* in a positive direction) had more positive, gregarious, and prosocial interactions with their peers and were less withdrawn and aggressive. Changes in children's child care center or setting were not related to children's social competence with peers.
Lamb, Hwang, Broberg, and Bookstein (1988)	140 children 53 centers 33 family day care homes 54 maternal home care situations	100% Swedish children Range of socioeconomic status represented 100% two-parent families Older mothers (average age = 31)	Ages 1 to 2 Followup at ages 2 to 4	Longitudinal design Observational assessment of caregiver quality and home quality; parent ratings of social support Direct assessment of child outcomes	Personal maturity (independence, ego resiliency, and control) Sociability *Adult-child interaction* Peer play Activity level	As measured at followup, children's sociability and personal maturity were not related to type of child care. The quality of care (regardless of type of provider) and family social support predicted personal maturity and social skills with familiar peers and unfamiliar adults.
Melhuish, Mooney, Martin, and Lloyd (1990a); Melhuish, Lloyd, Martin, and Mooney (1990b)	193 children Focus groups: Home care--57 Relative care--30 Family day care--74 Center care--32	100% British Range of socioeconomic and educational status	Age 1½ Assessments at 5 and 18 months	Longitudinal design Observational measures of child care quality Direct assessment, observer ratings, and parent reports of child outcomes	Language development Cognitive development	Children in center care settings that provided less verbal communication with and less responsiveness to children scored lower on a measure of language development.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Vandell, Henderson, and Wilson (1988)	20 children Six centers	White Middle socioeconomic status	Age 4 Followup at age 8	Longitudinal design Observational assessment of classroom quality Direct and videotaped assessment of children Observer, parent, and peer ratings of behavior	Interaction with peers Interaction with adults Solitary play Unoccupied behaviors	Children attending centers rated as high quality tended to have more friendly interactions with peers, were assessed as happier and more socially competent, and were less likely to be viewed as "shy"; results were relatively consistent at ages 4 and 8. Having positive interactions with adults at age 4 was significantly correlated with ratings of empathy, social competence, and peer acceptance at age 8.
Studies Using Pre-Post Designs						
Howes, Smith, and Galinsky (1995)	880 children 150 centers	Range of socioeconomic status and urban/rural families represented in the state of Florida (other demographic characteristics not reported)	Ages 10 months to 5 years (Different children examined during baseline and follow-up data collection; second followup to be completed in spring 1996)	Pre-post design Observational assessment of classroom and teacher quality Direct assessment and observer ratings of child outcomes	Peer play Object play Adaptive language proficiency Behavior problems Attachment to caregiver	Changing child-teacher ratio requirements for infants from 6:1 to 4:1 and for toddlers from 8:1 to 6:1 resulted in more complex child play both with peers and objects, more secure attachment to caregivers, greater adaptive language proficiency, and fewer behavior problems (including aggression, anxiety, and hyperactivity). Children in classrooms meeting professional standards for child-teacher ratios engaged in more elaborate peer play and had higher adaptive language scores, compared with children in classrooms with higher ratios. Children in classrooms that improved by shifting to teachers with Child Development Associate (CDA) credentials or CDA equivalency had the largest increase in complexity of peer play and security of caregiver attachment. Children in classrooms with college-educated teachers who had early childhood training engaged in more complex peer play, had a more secure attachment with their caregiver, and had higher adaptive language scores.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Ruopp, Travers, Glantz, and Coelen (1979)	1,600 children 49 centers in three cities in quasi-experiment; eight centers in one public school district in randomized experiment Infant/toddler substudy: 74 groups of children and 54 centers	65% African American 30% white Range of socioeconomic status, with low-income overrepresented Less than 50% two-parent families	Ages 3 to 5 (Infant/toddler substudy: ages 6 weeks to 3 years	Pre-post design (observational and child outcome data collection over a one-year period) Observational measures of classroom quality Direct assessment of child outcomes Randomized experiment and quasi-experiment (Note: The findings for preschoolers are from the 49-center quasi-experiment and are generally supported by findings from the separate, randomized experiment.)	Cognitive knowledge/school readiness Receptive language ability Adult-child interaction Social behaviors (cooperation, innovation, apathy, distress) Fine and gross motor skills	Preschool children attending centers with smaller group sizes engaged in more adult-child social interaction, were more cooperative, responsive, and innovative, and made greater gains in receptive language ability; the effect of group size on receptive language ability was independent of child age, gender, race, family income, and other socioeconomic background characteristics. Preschool children in centers that promoted reflective, innovative, and involved behavior showed greater gains in receptive language ability and cognitive knowledge. Children in centers where caregivers exhibited high levels of social and managerial interaction with children showed more rapid gains in receptive language ability. The effects of these center and caregiver characteristics on receptive language ability and cognitive knowledge were independent of child age, gender, race, family income, and other socioeconomic background characteristics. Preschool children attending centers with teachers better trained or educated in child-related fields had more social interactions with teachers, were more cooperative, compliant, and involved, and had greater gains in cognitive knowledge; neither years of teacher experience nor level of formal education showed a consistent relationship to child outcomes. Relationships between preschool child-caregiver ratios (5:1 to 10:1) and caregiver and child behavior were neither strong nor consistent; ratio was unrelated to gains in child test scores.

TABLE 1 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Ruopp, Travers, Glantz, and Coelen (1979) *(continued)*						Toddlers attending centers with better child-staff ratios exhibited less overt distress; toddlers cared for by experienced staff exhibited more apathetic behavior; the degree of specialized staff training had no effect on child distress, child apathy, or exposure to potentially dangerous situations. Infants attending centers with better child-staff ratios exhibited less overt distress, less apathetic behavior, and were exposed to fewer potentially dangerous situations; infants cared for by better educated but less experienced staff exhibited less apathy and were exposed to fewer potentially dangerous situations; infants cared for by staff with specialized training showed no significant behavioral differences.

NOTE: Only findings that the authors report as statistically significant are included in this table.

TABLE 2

FAMILY CHILD CARE STUDIES THAT EXAMINED QUALITY OF CARE AND CHILD OUTCOMES

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Studies Using Contemporaneous Designs						
Goelman and Pence (1987; and 1988)	105 children 53 centers 52 family day care providers	Predominantly white (Canadian) Range of socioeconomic status represented 50% two-parent families	Ages 3 to 4 Specific ages not provided	Contemporaneous design (observational and child data collection over a one-year period) Observational assessment and parent ratings of classroom quality Direct assessment of child outcomes	Language development Peer interactions Play activities (solitary, cooperative)	Children attending high-quality family day care homes had higher average scores for language development than children attending lower-quality family day care homes. Amount of "information activities" was not related to quality.
Goodman and Andrews (1981)	52 children 32 family day care providers (enhanced) (Control group receiving nonenhanced family day care: 8 children) (Comparison group receiving center-based care: 68 children, three centers)	43% white 57% African American	Ages 2½ to 4	Contemporaneous design An educational intervention was used to assess quality (the intervention varied in intensity among three treatment groups but in each case focused on the development of linguistic competence). Direct assessment and observer ratings of child outcomes	Cognitive performance Verbal intelligence	Children receiving an enhanced family day care intervention showed greater improvement in cognitive performance on three standardized tests than did either control group children in family day care settings or comparison group children in professionally run group day care centers.
Howes and Rubenstein (1981)	40 children (20 in family day care) Eight centers 16 family day care homes	33% African American, Hispanic, or Asian 67% white Predominantly two-parent families Middle socioeconomic status	18 to 24 months	Contemporaneous design Observational assessment of classroom quality Direct assessment and observer ratings of child outcomes	Peer social behaviors Peer social interaction Structure of peer play	Among family day care homes, smaller group sizes and the presence of older peers in the group positively influenced children's vocalization to peers. No overall significant differences in the frequency of socially directed peer behaviors were found between family day care and center care.

TABLE 2 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Howes and Stewart (1987)	55 children 55 family day care homes	Heterogeneous social classes and parent educational levels (including 18% low socioeconomic status) 82% two-parent families	Ages 11 to 30 months	Contemporaneous design Observational assessment of family day care quality Direct assessment and observer ratings of child outcomes	Play with peers Play with objects Play with adult caregivers	A greater number of changes in the family day care provider was associated with lower level play with objects and peers. For boys, earlier child care entry and fewer changes in provider were also associated with higher-level play with objects. Higher overall quality of care was related to higher levels of competent play with adults and with objects; for girls, the relationship was also significant for higher-level play with peers.
Kontos (1994)	57 children 30 family day care providers	Middle socioeconomic status 82% two-parent families	Ages 2½ to 4 years	Contemporaneous design Observational assessment of family day care quality Direct assessment and teacher ratings of child outcomes	Cognitive play Intelligence quotient Language interaction Receptive vocabulary Social play and sociability	Children in family day care homes that were rated at a higher level of overall quality were significantly less likely to engage in simple cognitive and social play, were rated as significantly more sociable, and scored higher in receptive vocabulary, controlling for maternal education, caregiver experience, and conditions of caregiving. Children in higher-quality family day care homes who had mothers with more education and caregivers with less experience were rated as significantly more sociable. Children in higher-quality family day care homes who had mothers with a higher level of education scored significantly higher in receptive vocabulary.

TABLE 2 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Kontos, Howes, Shinn, and Galinsky (1995); Galinsky, Howes, Kontos, and Shinn (1994)	226 children 226 family day care providers	42% white 23% African American 31% Hispanic Heterogeneous social classes and maternal educational levels 81% two-parent families	Ages 10 months to 5 years	Contemporaneous design Observational assessment of family day care quality Direct assessment, observer ratings, and caregiver ratings of child outcomes	Peer play Attachment security Social adjustment/behavior problems Object play Use of language	Children with sensitive and responsive caregivers were more likely to be securely attached to their caregivers. Children who spent more time with their caregiver, were cared for in homes with more children per adult, and had caregivers who used more-responsive interactions engaged in a greater amount of play with objects; children with more-educated mothers and more-responsive caregivers engaged in more high-level object play. Larger group sizes and child-staff ratios were related to more peer play. Higher global quality was related to more object play, more high-level object play, and better child attachment security; however, higher global quality was related to less high-level peer play. Neither family background characteristics nor child care characteristics (structural or process quality) predicted children's language development or social adjustment. Maternal working conditions and number of hours worked were unrelated to all aspects of children's development.
Studies Using Pre-Post Designs						
Galinsky, Howes, and Kontos (1995)	130 children 130 family day care providers	Geographic diversity (other sample demographics not provided)	Ages 1 to 5 (approximate, exact ages not given)	Pre-post design Observational assessment of family day care quality Direct assessment and observer ratings of child outcomes	Peer play Attachment security Object play	Children with caregivers who had participated in a 16-hour training course behaved in a manner indicative of a secure attachment with their caregiver, were more engaged in activities (such as listening to stories), and spent less time wandering aimlessly, compared with children whose caregivers did not receive the special training course.

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TABLE 2 *(continued)*

Study (Date)	Sample Size	Sample Demographics	Age Range	Design and Methodology	Outcomes Measured	Relationships Between Quality and Child Outcomes
Studies Using Longitudinal Designs						
Lamb, Hwang, Broberg, and Bookstein (1988)	140 children 53 centers 33 family day care homes 54 maternal home care situations	100% Swedish children Range of socioeconomic status represented 100% two-parent families Older mothers (average age = 31)	Ages 1 to 2 Followup at ages 2 to 4	Longitudinal design Observational assessment of caregiver quality and home quality; parent ratings of social support Direct assessment of child outcomes	Personal maturity (independence, ego resiliency, and control) Sociability Adult-child interaction Peer play Activity level	The quality of care (regardless of type of provider) and family social support predicted personal maturity and social skills with familiar peers and unfamiliar adults As measured at followup, there was no significant relationship between type of child care and children's sociability or personal maturity

NOTE: Only findings that the authors report as statistically significant are included in this table.

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